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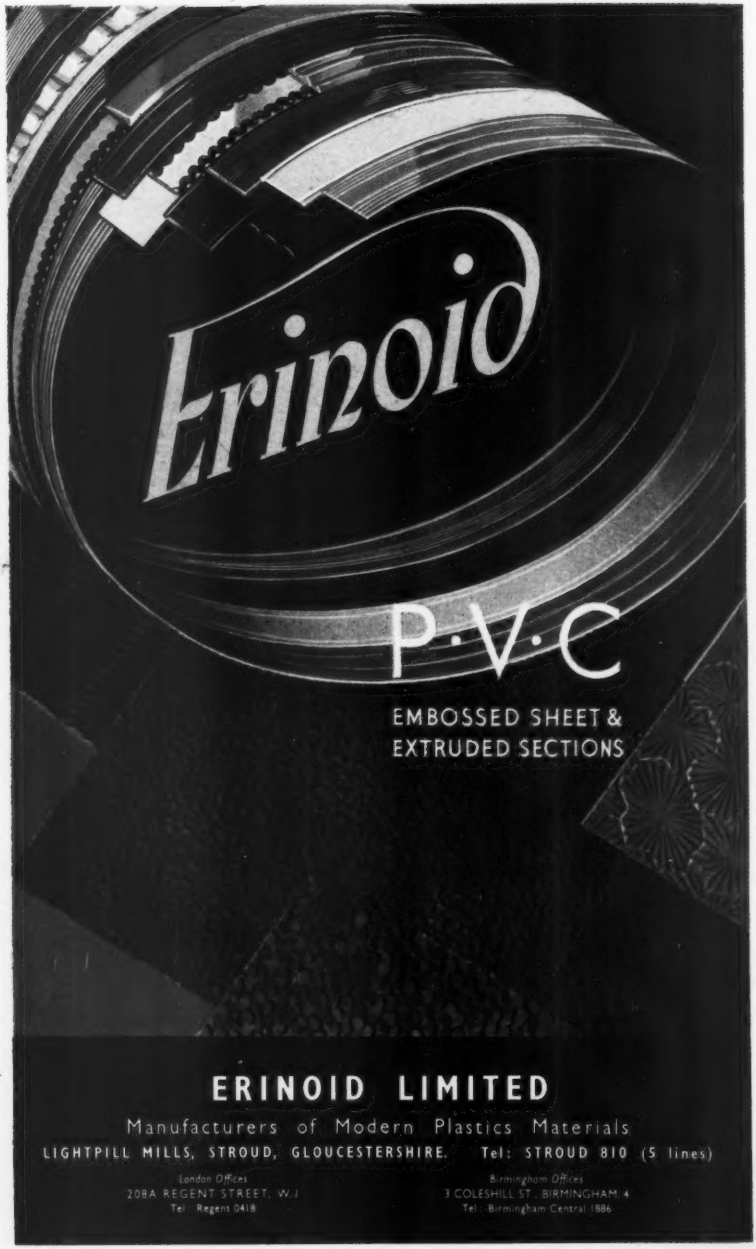
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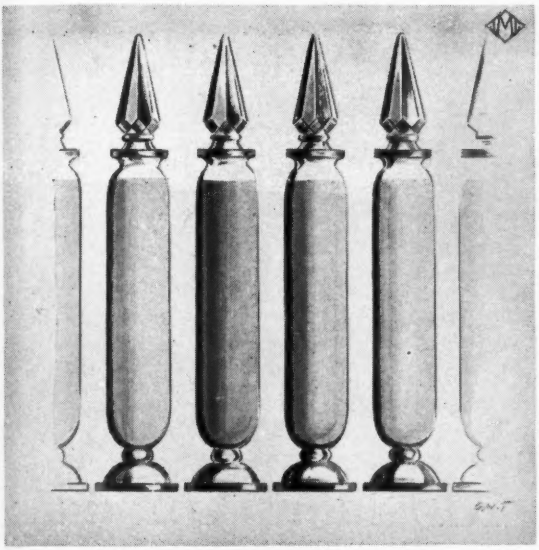

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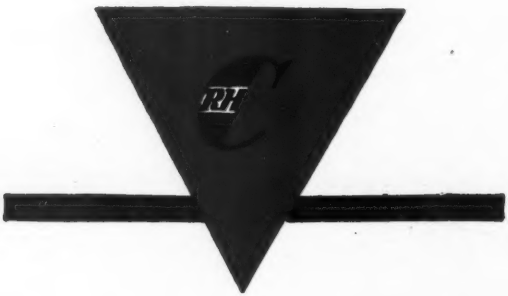

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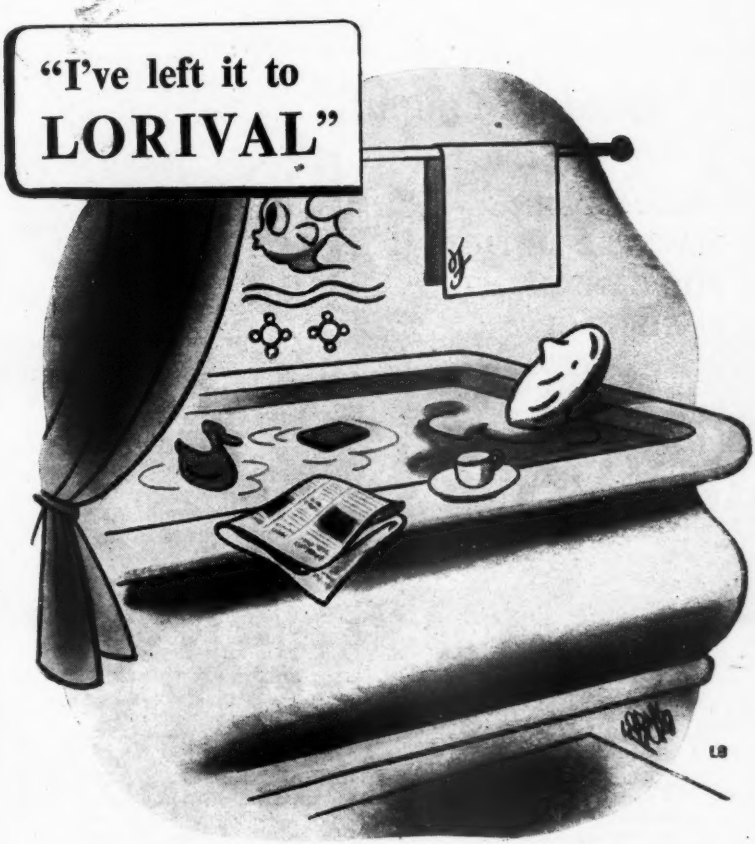

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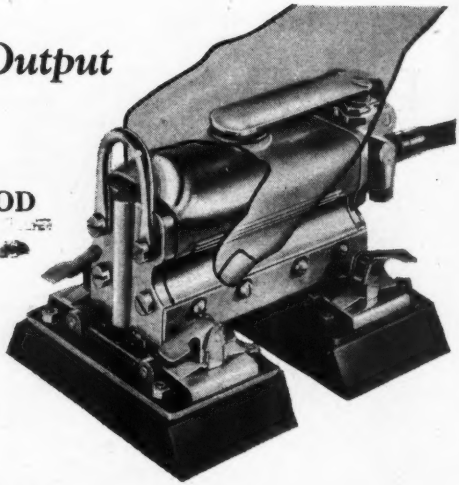

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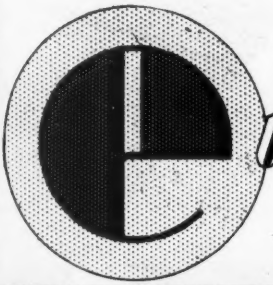

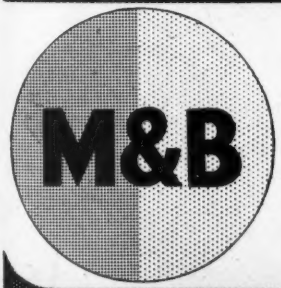

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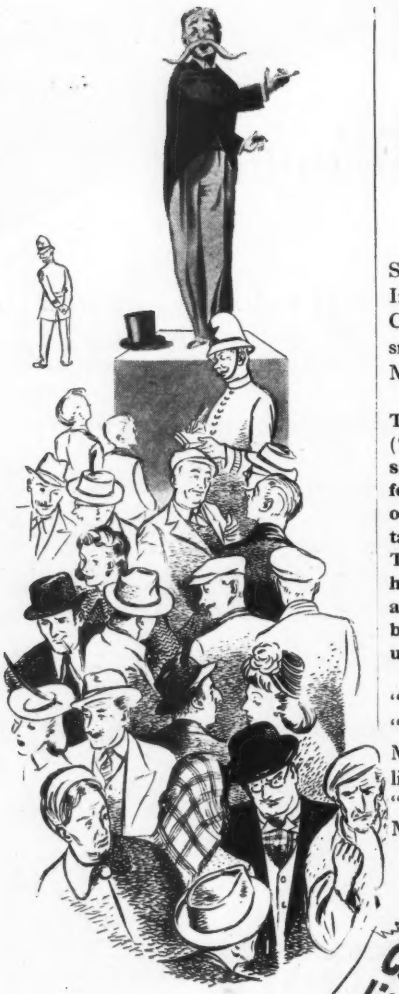

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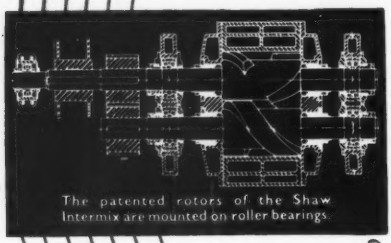
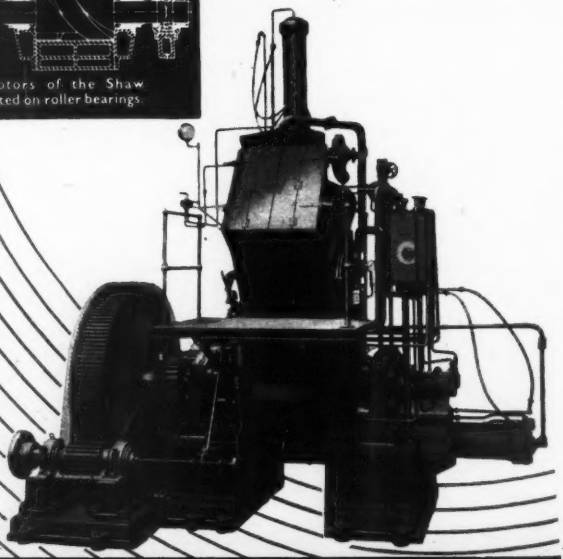


The patented rotors of the Shaw Intermix are mounted on roller bearings.



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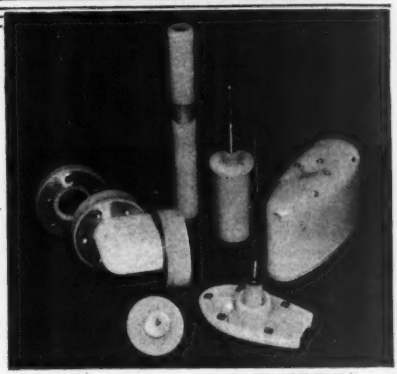
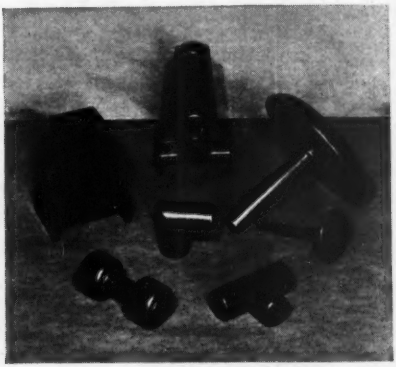


Moulded insulators in natural "TELCOTHENE" incorporate metal inserts.



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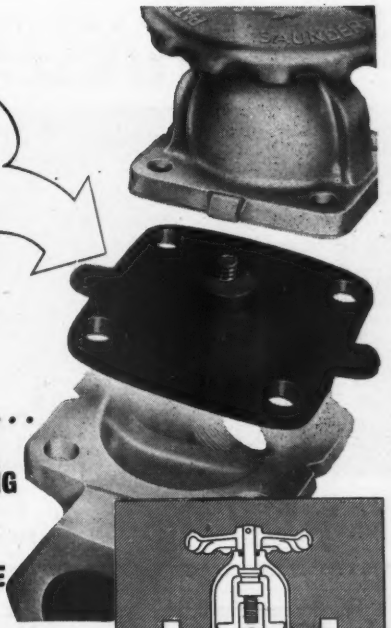

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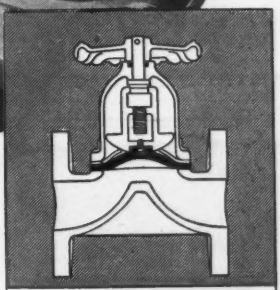

The illustrations are of the Saunders resilient diaphragm valve for the control of oils, slurries, pulverised ores, fatty acids, etc., and are reproduced here by the courtesy of The Saunders Valve Company Ltd., Cwmbran, Newport, Mon.

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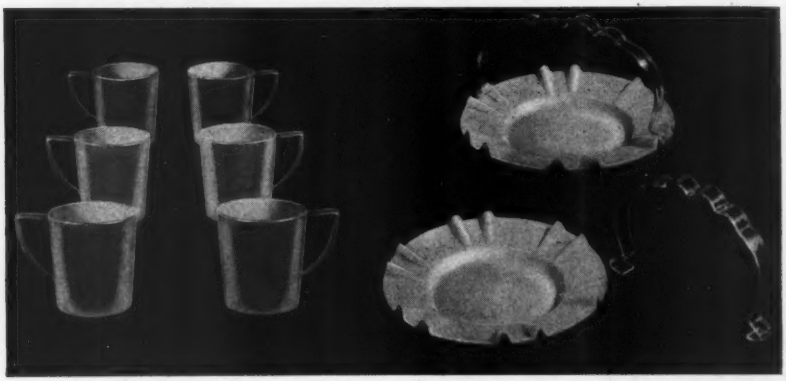

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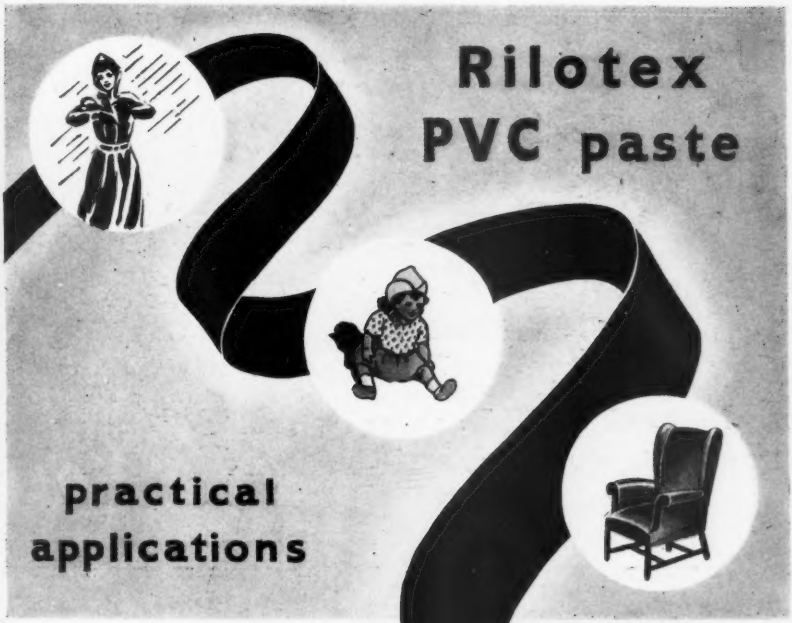

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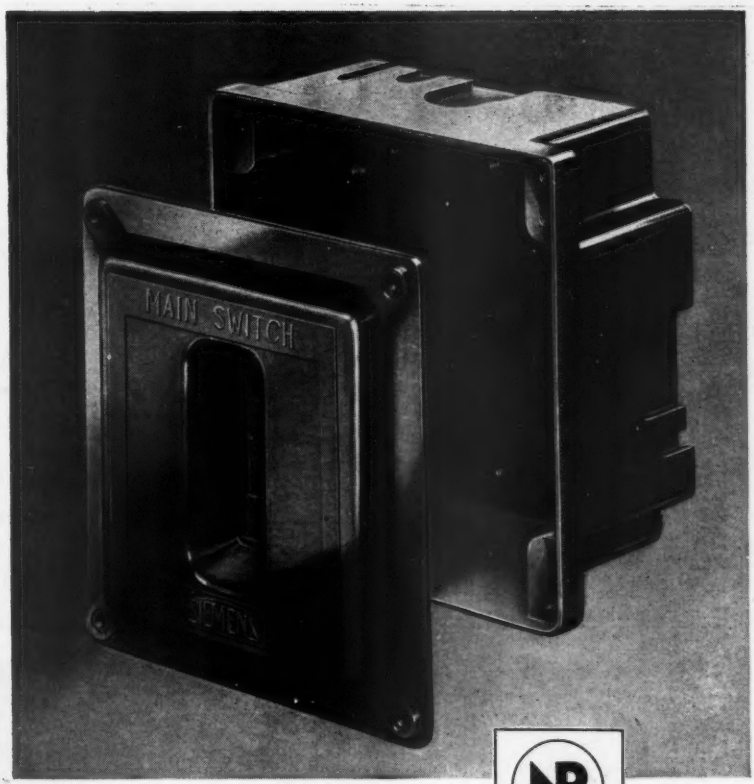

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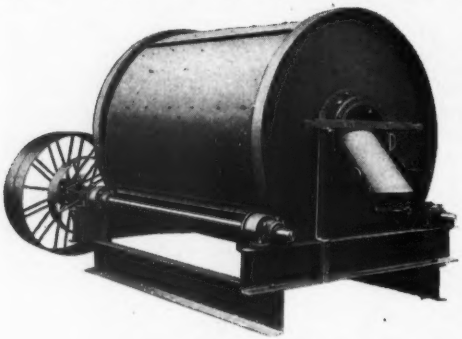

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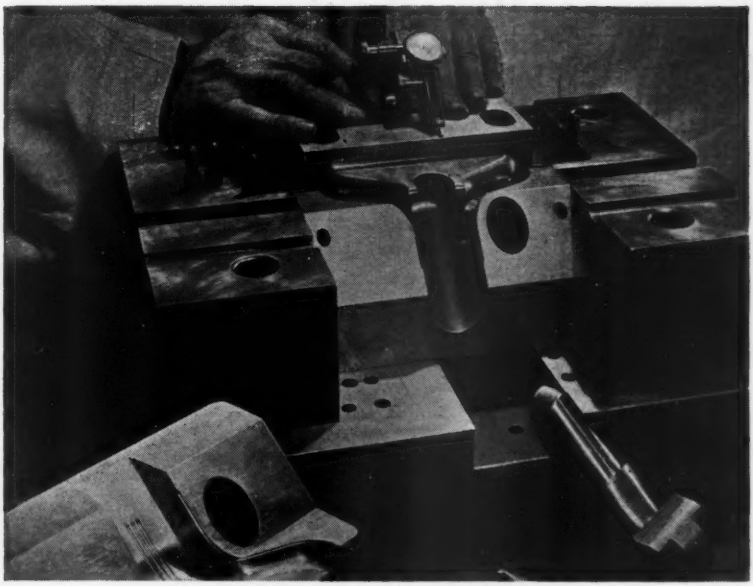

We show the sections of an injection tool for moulding a vacuum-cleaner nozzle in thermo-plastic material ; a coring piece is being checked for true alignment during assembly. As the press opens, this part is automatically withdrawn, the moulding then being free to hinge out on the fulcrum of the round coring piece shown in the foreground.

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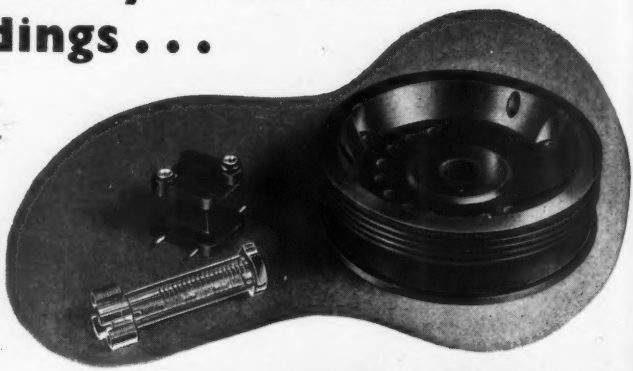

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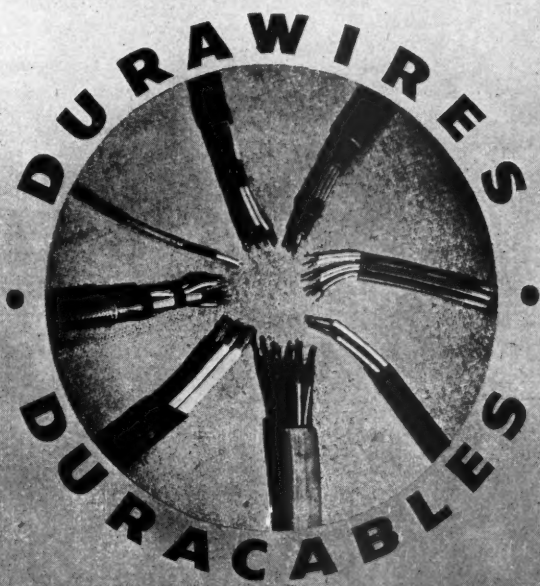

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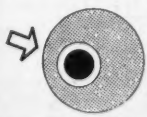

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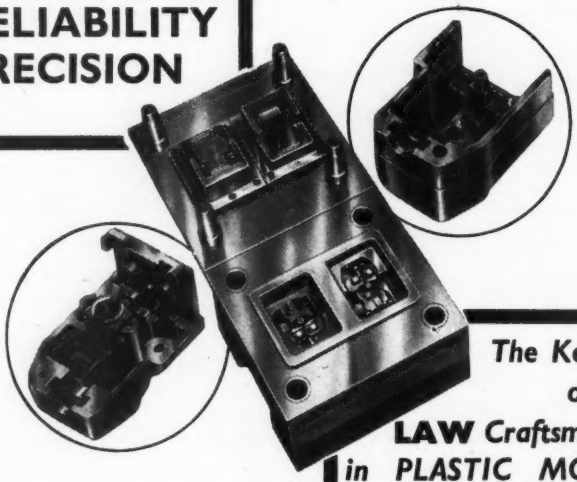

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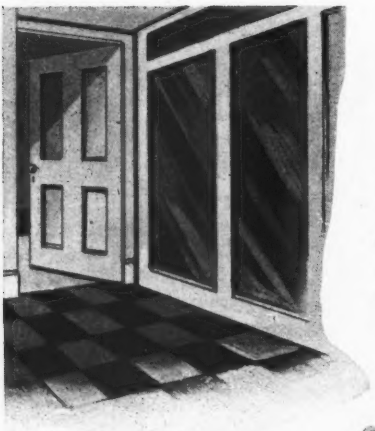

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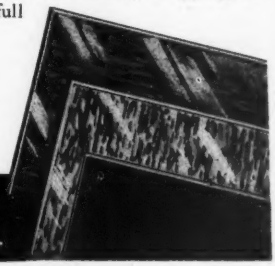

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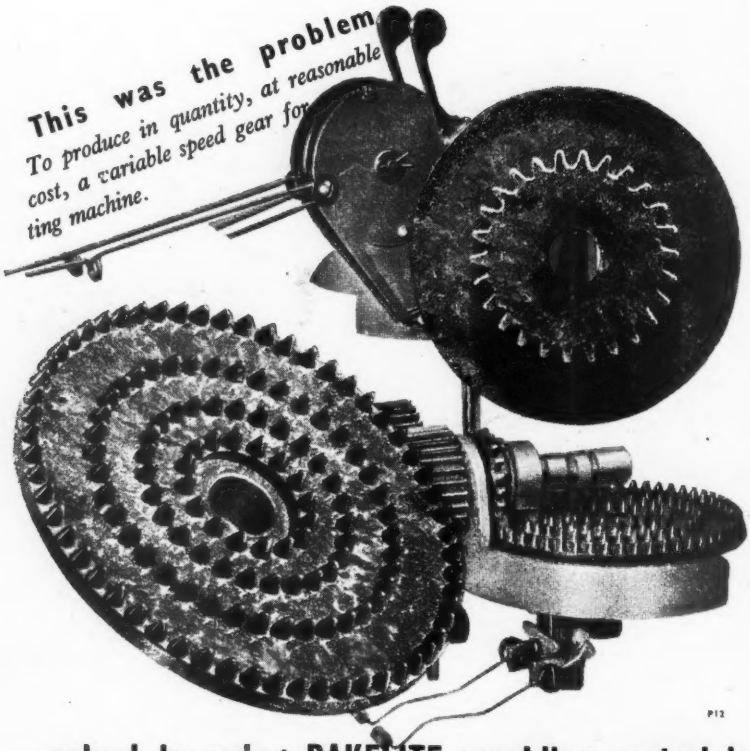

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Vol. XIII. No. 142. MARCH, 1949

Plastics

Dealing with the Manufacture, Uses and Potentialities of Plastic Materials

Proprietors - - TEMPLE PRESS LIMITED
Chairman and Managing Director ROLAND E. DANGERFIELD

Editor - - - M. D. CURWEN, B.Sc., A.R.I.C.
Offices - - Bowling Green Lane, London, E.C.1

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NOTICES

"PLASTICS" is published monthly in London, England.
Annual subscription rate 26/-. Shorter periods pro rata.

All instructions, matter and passed proofs of all kinds of advertisements must reach the Head Office of "PLASTICS" by the 24th of preceding month to ensure insertion.

Head Offices:
Bowling Green Lane, London, E.C.1.
Inland Telegrams - - "*Pressimus, Phone, London.*"
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Telephone - - *Terminus* 3636 (*Private Exchange*).

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EDITORIALS

Twenty (and more) Questions

WE are a nation, or, if you like, a world, of scientific, economic and political "rubber-necks" for ever scanning the heavens to learn the secrets of the stars and beyond. This we believe to be a good thing and one day we shall reap the reward of this research. But are we not in danger of forgetting the ground on which we walk and build? There are so many small, yet important, problems at our feet in our lives that would pay handsomely if they were solved. In our ordinary industrial lives, there must be many of them which we cannot see because we are looking at what we think are the most important ones.

They do not always need the great brains of the world to elucidate. Sometimes they need a chemist, a physicist, a mathematician. Sometimes, the solution is already available elsewhere—only the "liaison" is absent. As often as not, just to see the problem is to end it—we need the time to see and to think.

It would pay as well if each works manager were given a week off once a year to hie himself to a lonely coppice for what we might call a "Contemplation Week." Here he would put down on paper some of the difficulties or problems in his works which normally, in the hurry and scurry of production, he has never had time to consider.

These thoughts have been brought to mind by a recent talk to the Institute of Packaging by Major K. M. Cave, of British Drug Houses, Ltd., on the subject of packaging in the pharmaceutical industry, for it is obvious that he has had his Week of Contemplation with interesting results. In an industry with some 3,000 raw materials, numberless patent medicines, 2,000 types of pills, 700 injections, 8,000 analytical and other chemicals, where the weight of a pack may be 1 grain or 1 ton, and numbers from 1 to 100,000, Major Cave has been able to see some of the "lesser" problems. Here are a few:

As for the bottle-stopper problem, he said, some have looked for a solution in the realm of plastics. Solid polythene had been tried, but was too hard. Now a hollow stopper had been produced with considerable success. The stopper tended to jam too tightly if tapped too hard; but no sign of a leak had appeared, even when used with strong acids.

A second point related to the packing of strong mineral acids. To comply with shipping regulations it was necessary to pack in chalk or chalk mixture, which would soak up the liquid and kill the acid by chemical reaction, should the bottles be broken. Unfortunately, after a time chalk sets and becomes a hardish sheath round the bottles. The problem was to find some cheap inert substance to replace a portion of the chalk to maintain some resilience, or alternatively something with which to conveniently surround the bottles themselves.

The packaging of hydrofluoric acid also presented many problems, and the best solution would be bottles made of polythene. The acid appeared to have no action on this substance, but the drawback was the present high prices.

In the case of the cleaning and polishing of glass ampoules, Major Cave maintained that this was not merely a selling point but an absolute necessity. Ampoules that contained any foreign matter whatever were rejected out of hand. One type of foreign body that was apt to get into the filled ampoule was particles of glass, which sometimes flew inwards from the neck when it was cut to length before filling. Cleaning and polishing were now carried out by hand, and he would like to know of some mechanical means of doing the job.

Another mechanical problem that would be highly profitable to solve would

be the introduction of a semi-automatic method of stuffing tablet bottles. At present cotton wool or strips of waxed paper were pressed by hand into the bottles. The operation was usually performed with a knitting needle, taking about 25 minutes per 100 bottles. There was a large reward for anyone who could solve this problem. He did not think it was insoluble.

We did not bring up this subject to show where plastics can be used. Sometimes they can be, sometimes they cannot. It is merely an appeal to rest on occasion and to look, for we are sure greater economic efficiency will thereby result.

Annus Mirabilis

WITHIN the past six months we have seen a major revolution taking place in this country regarding the distribution of part of our food. At last the "deep-freeze" method of storage and distribution has been brought directly to the public.

The revolution took place in the U.S.A. a good deal earlier—her methods of food distribution have always been superior to ours. It also took place in the better sections of our own catering industry more than a year ago, although few lunchers and diners at our better restaurants realized whence came the peas and beans, although they relished their unaccustomed freshness.

To-day, we see the miracle of the public being able to buy peas and beans and certain soft fruits in March—vegetables and fruits that are six to eight months old, yet taste as fresh and as wholesome as if they were picked to-day. We can also have our fish really looking and tasting fresh, instead of it being very dead.

Another significant fact brought home to the public is the edifying knowledge that all these good things are untouched by hand from the time they are processed and packed under hygienic conditions until they are received by the customer from the cold tank in the shop. The public—significantly again, is now realizing what an unhygienic, messy and economically wasteful process of selling these foods the old method was. We have, therefore, two things to be grateful for—the "invention" of the deep-freezing process, which although not in fact quite new (there was a factory in Grimsby working it in 1930) is new to the bulk of the world, and also the amazing advances reached in modern methods of packaging.

All things considered, there is little doubt that that section of the plastics industry which produces protective packaging, especially in the form of transparent film, has a brighter economic future than ever before.

The most desirable quality of packings in this new industry is that moisture vapour should neither pass from the contents outwards, nor from the outside into the package, otherwise spoilage takes place. Many packs consist of paraffin-wax treated cardboard, but while the wax is very suitable from the point of view of water-vapour resistance, it is exceptionally weak mechanically and therefore is not an ideal protection.

Almost all the plastic films are water resistant, but this is very different from being water-vapour resistant. Some few are not, in fact, satisfactory in this respect for deep-freeze storage in their present forms, and manufacturers are carrying out researches in this direction for their improvement. Their use is indicated as direct packs or as liners in waxed containers.

At the moment, "Cellophane" and perhaps other cellulose films are widely employed. Cellulose acetate has not yet reached this stage, but no doubt will eventually. Polyvinyl chloride, while possibly adequate from the water-vapour resistance point of view, is "suspect" for other reasons, while polythene film, presumably a future certainty for this application, is not yet in adequate supply.

Nor have we yet "Pliofilm" (rubber hydrochloride) of our own make in sufficient quantities, although rumours

are afoot that we soon shall. This material is exceptionally useful for the purpose. From the U.S.A. we hear of the emergence of the new "S" polymers —co-polymers of styrene and isobutylene, for which claims are made as to their high resistance to the penetration of moisture vapour and gases, coupled with high tensile strength.

A novel type of film, made here by the Robinson Waxed Paper Co., is "Essofilm." This is a laminate between aluminium foil and "Clarifoil" (transparent acetate film made by British Celanese, Ltd.) so that we have in it a material both highly resistant to water vapour and capable by printing of decorative effects.

We shall eventually have a number of excellent materials for the job, capable of being H.F.- or heat-sealed, and transparent, so that the public will receive its food in perfect condition and also see what it is getting in an attractive package.

Metal Protection

READERS will have remembered the frantic search during the war for a protection of metal against corrosion which would be adequate, more especially in the tropics where humidity is so high. Eventually, following the comparatively ineffective use of petroleum jelly, petroleum-jelly-resin compounds, waxes, and so on, there emerged what has proved an excellent method of protection by dipping in a mixture of ethyl cellulose suitably modified to produce a molten compound at about 300 degrees F. On removal, the metal object is completely coated with a strong impermeable skin which can be removed quite easily when required.

Readers will also no doubt have wondered why some form of rubber dipping could not be applied. In fact, neither rubber solutions nor rubber latex could then be used, the first because of the necessity for removing solvents and attending difficulties, and the second because rubber latex consists of rubber dispersed in water—although excellent skins are formed, some of the water adheres to the metal and corrosion results.

It is, therefore, most interesting to learn that this objection to using rubber latex has been overcome by a startling, not to say curious, discovery of the Chemical Research Laboratory of the Department of Scientific and Industrial Research. It is that sodium benzoate—a compound normally used for its antiseptic and sometimes food-preserving qualities—also possesses the outstanding property of inhibiting the corrosion of metals. This was first discovered during the war; it was found that when added in small proportions to glycerine or glycol, that is in anti-freeze solutions for automobile engines, it inhibited corrosion of metal parts.

More recent work at the Laboratory has applied this discovery to wrapping materials, and even more recently, in collaboration with the Rubber Producers Research Association, to the matter previously indicated, that is, to the provision of thick protective coatings to metal for its protection, especially in tropical climates.

Sodium benzoate is added to the latex, and simple dipping at normal temperatures produces a protective coating with good mechanical properties combined with that of corrosion prevention. Large articles can be sprayed and the coating with or without an incorporated tape can be readily removed. Other emulsions, including synthetic rubbers, can be used with the benzoate.

"DESIGN."—The Council of Industrial Design are to be congratulated upon their recent enterprise in the form of a new monthly journal, "Design," of which we have had opportunity of perusing the issues for January and February. Each issue contains at least one article in which the subject of design in industry is considered in its broader aspects. There are also notes on new materials and methods of production, reports from overseas, and, not least important of all, various illustrated articles which show how the good design of certain products of industry has been related to the techniques of manufacture and requirements in marketing.

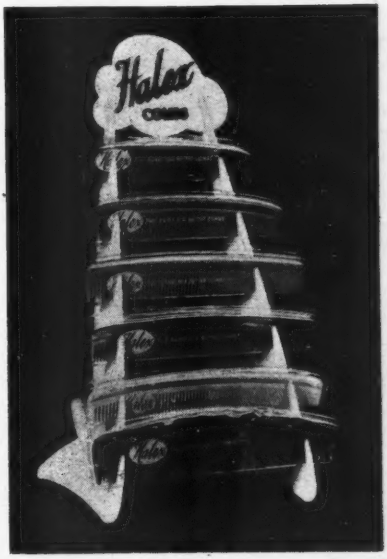
Design for a Display Stand

An Interview with the Designer

Eric John Doudney,
F.R.B.S., F.R.S.A., M.S.I.A.

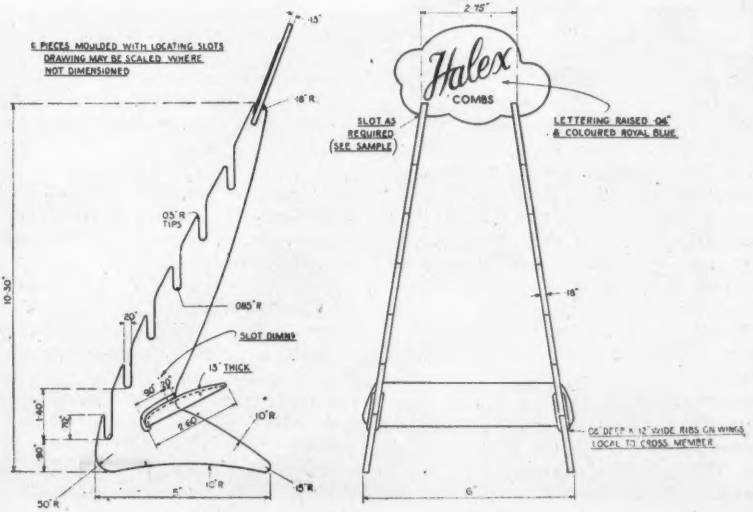
MR. DOUDNEY is a sculptor as well as an industrial designer, and he says—perhaps with his tongue in his cheek, although with a certain amount of truth—that the sculptor's training is probably the finest available for the future industrial designer. However, he did mention that he had had several years' training and experience as an engineer, and this provides a most happy combination. He is now mainly concerned with industrial design, and particularly with the plastics industry.

The display stand here discussed is moulded by Halex, Ltd., in cream cellulose acetate, with raised blue lettering. Its purpose is to display a range of combs made by that company.



As on a former occasion, we put various questions to the designer and set forth below the answers which he gave.

QUESTION: What are your first thoughts and considerations when asked to design a stand of this kind?



ANSWER: My first consideration with this design, as with any project for that matter, concerns the available data and if it can be implemented by any research on my part or by my clients. With this particular article I had to be sure of my information regarding the combs which it was intended to display, how many, how big, packed or unpacked, interchangeability, lettering required, quantity and cost, colour and material, etc.

Having assembled the known facts and requirements, I proceed to make a number of rough sketches to help myself visualize more clearly the various ideas I get that fit these requirements. After perhaps a dozen or more sketches are made, I usually find one that I can develop.

QUESTION: What happens then, do you show your client the sketches or only one of them?

ANSWER: I show none of the rough sketches, but go straight on to make a working drawing, in this case a very simple one. I find with many jobs that until I have made a mechanical drawing I cannot quite crystallize the product, nor, in fact, know that the client's requirements are met and that my own sensibilities are satisfied.

I then prepare a more finished visual or perspective drawing if the client requires it, though I prefer to submit the infinitely more explanatory model or prototype. Even the designer himself cannot be completely sure until he sees and tests the prototype. This advisability of a three-dimensional presentation varies, of course, with the article in question, but with many things it is absolutely essential. Any modifications that are decided after consideration of the prototype are, of course, transferred to the working drawing.

QUESTION: Were there any modifications made or suggested to this present design?

ANSWER: As a matter of fact there were two or three complete changes of design before this one was finally decided on. The reasons were mainly a change of specification by the client. Initially, a large number of combs were specified and a less degree of interchangeability was required. It was at my request that the number was reduced to six; this to enable a stand to be produced at reasonable cost and not too unwieldy in appearance.

QUESTION: Why was the winged or wing-like shape decided on?

ANSWER: There are several reasons. First, it provided good material utilization when made up from sheet. The specification required that this stand be suitable for fabrication from sheet, as well as for moulding by injection. Secondly, this shape has a certain pleasant grace, a quality which in this case put nothing on the cost of production. Thirdly, it was requested that a family likeness be aimed at with a toothbrush display stand which I had previously designed for Halex.

QUESTION: Regarding the cloud shape at the top, what was the reason for that?

ANSWER: The particular reason for this part of the stand was the need for a space of some prominence showing the word "Halex," and for a strengthening piece at the wing-tips forming a section which was easy to assemble yet rigid on completion. The asymmetrical shape was, I thought, more suited to the wing motif than was a geometric shape; it was also altogether lighter and more graceful in appearance.

QUESTION: What things have specially to be considered when designing a display stand?

ANSWER: The absolutely essential thing to consider, of course, is that the display stand actually "displays" the goods in question, but does not make its presence too prominent.

It should stand safely and hold the merchandise securely. It should form a frame, focus or background, unobstrusive in itself, if possible, while isolating and enhancing the appearance of the goods against probably competing products. It is a selling aid and I feel it should, if possible, remain that and never be a packing case, descriptive leaflet, and display combined. Such multiple uses

are often tried, but are very rarely successful.

QUESTION: Why were plastic materials chosen?

ANSWER: There are two or three reasons. First, in the case of the injection moulded stand where cellulose acetate was chosen, the manufacturers have all the equipment for producing this type of article and could make at a competitive price a cleaner-looking stand than would be possible in, say, wood or aluminium. For export, polystyrene could be used in place of cellulose acetate.

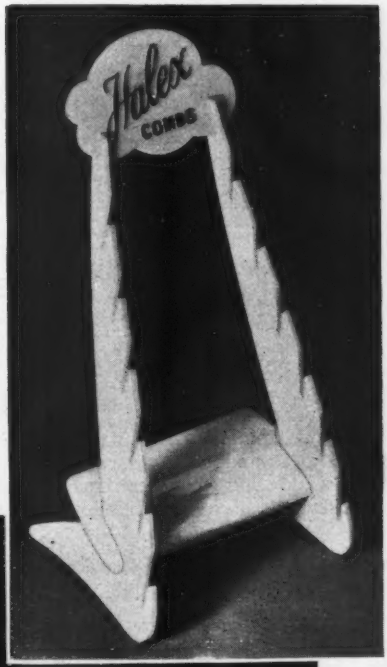
When made from sheet, we chose "Perspex" as being a fine quality material with good appearance and the necessary rigidity; sheet acetate was rejected owing to its lack of stability after fabricating.

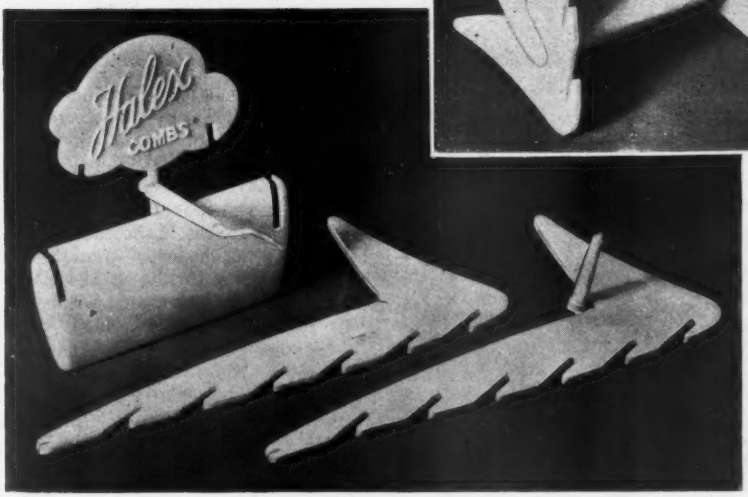
QUESTION: Were any snags encountered after the design had been adopted?

ANSWER: In this case very little trouble was met with. A slight adjustment had to be made in the tool to obtain a better alignment of the assembly slots. However, very simple tools were called for: the sides are identical and not handed, so a tool for only one was required, while another tool produces the cloud piece and the lower cross-piece in one shot.

QUESTION: Is not packing for transport something of a problem with this particular design?

ANSWER: These stands are only sent out singly to retailers, so there is no stacking problem. It would be possible to pack them flat and assemble on arrival, but my client thought this inadvisable.



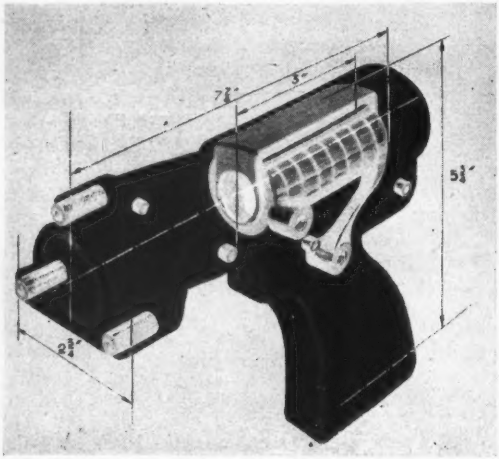


Stud Welding Gun

New High Level in Moulding by Ashdowns, Ltd.

MANY years ago we wrote: "It is in the hard industrial world of engineering that plastics will find their best testing-house. If the electrical, mechanical and chemical engineers of the world find them satisfactory for specific jobs, then it will follow as the night follows the day that all other industries will accept them in their proper rôles."

We have, since, often proved this assertion. Now again, we give an example of what we mean and which surely places our industry, especially one section of it, in the forefront of industrial endeavour, providing a technique and a material which cannot be replaced by any other, modern or traditional. Here is the story.



"Ghost" drawing of gun shows threaded inserts and copper solenoid incorporated in the moulding.

Ashdowns, Ltd., the well-known moulding concern, of St. Helens, Lancashire, were approached to produce a housing for the novel Nelson H gun, an arc stud welder of outstanding efficiency, now being distributed by Crompton

Parkinson, Ltd., of Crompton House, Aldwych, London.

The requirements of the job were especially onerous, for there are at one and the same time two outstanding engineering requirements, the one electrical and the other mechanical: the first, because the welding of a steel stud to the base plate is accomplished by the creation of an electric arc between the end of the stud and the plate, and because of the provision within the body of the gun of a large copper coil which acts as a solenoid for control purposes; the second, because of the exceptionally rough usage the gun undergoes, being subject not only to severe shocks during actual operation but also to the hard usage normal in engineering shops. Lightness was obviously desirable.

Thus a full shock-resisting material coupled with good dielectric properties were necessary. For this, Bakelite X.199/3 was selected. This material provides for the following characteristics: Impact strength, 0.9-1.4 ft./lb.; cross-break strength, 12,000-14,000 lb./sq. in.; ultimate crushing strength, 30,000-35,000 lb/sq. in. Dielectric properties are also excellent.

As for the moulding itself, numerous complicated inserts, including the large copper solenoid already described, had to be positioned with great accuracy. Moreover, although the moulding was generally of very heavy section, there was only a mere covering of plastic material around the larger and heavier inserts. The quality of this aspect of the moulding job can be realized from the fact that not only was a high degree of insulation vital, but the slightest crazing would have rendered the moulding useless.

The Nelson Stud Welding Gun in action.

Careful research by Ashdowns, Ltd., coupled with systematic checking at all stages of production, has resulted in overcoming all difficulties in the manufacture of large quantities of the gun. We extend to this company our heartiest congratulations on a job that raises the status of the plastics industry to a new level. This is emphasized by a statement by the distributors of the gun, who say categorically that the unit has been found to be more suitable in this plastic than if it were made in aluminium alloys.

L

PLASTICS IN GERMANY

The New Target in Germany is the Science behind the Industries. The following are additional Notes from the Official Reports which can be obtained from H.M. Stationery Office.

F.I.A.T. Final Report 889.—Urea manufacture at the Oppau plant of I.G. is here reviewed, with full information on process and equipment. As far as could be ascertained the Oppau plant was the only production centre for urea in Germany. About 240 tons of solid urea per day were produced. Most of the equipment appears to be of very special design and represents considerable development work. Details are included in this report, together with a number of drawings.

F.I.A.T. Final Report 978.—This report relates to the production of acrylamides and the co-polymerization of butadiene with acrylamides, based on work done by the I.G. at Hoechst. A rubber for tyres, using a copolymer of butaliene and N-di-isobutyl acrylamide, was developed; resistance to wear was found to be very favourable. Extrusion of the tread material and manufacture of tyres presented no difficulty.

F.I.A.T. Final Report 984.—The whole of the phthalic anhydride production in Germany was manufactured by the I.G. at three units, for which total output was about 1,100 tons per month. Details of operating conditions and drawings of equipment at the Uerdingen unit (87 tons per month) are given. Some information is included upon the purification of the crude product.

F.I.A.T. Final Report 1118.—This report covers the various manufacturing processes employed in Germany during the war for the production of thin-wall tubing to be used as synthetic casings for sausages. Equipment is discussed in detail, and drawings of several important features are included. The industry had a normal output of 325 million metres of casings per year, which is equivalent to 1,600 lb. of finished sausage—an amount said to be roughly equal to that of the total production of sausage in the United States. The processes covered are those of viscose, hide fibre, nitrate, gelatin-paper, and parchment.

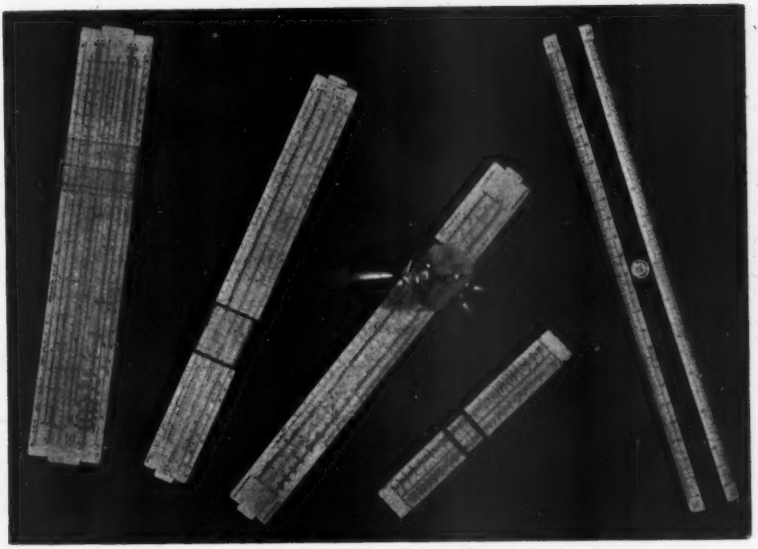
B.I.O.S. Final Report 999.—Manufacture and fabrication of p.v.c. in the Bitterfeld area is described with much detail in this report, which includes a complete schedule of plant parts and detailed drawings. Regarding fabrication methods for unplasticized material, there are details of rolling into rough sheets, calendering, manufacture of press-polished thick sheets, ram and screw extrusion, and compression moulding.

Outstanding applications of "Vinidur" depend on its resistance to a wide range of chemical reagents. Its properties, both chemical and physical are given at some length in "Kunststoffe im Technischen Korrosionschutz: Handbuch für Vinidur and Oppanoh," by Dr. W. Krannich (J. F. Lehmanns, Berlin, 1943), which has been reprinted in America. Among many items seen in the exhibition room were fabricated valves for Vinidur pipelines (tested as a routine up to 10 atmos.), pipes in all sizes up to 20 cm. diam., sieves and grids made from monofilament, dishes formed from sheet, acid buckets, funnels, and covering for pipe-lagging. Other applications included floor coverings, bed heads (using Vinidur as substitute for hardwoods), lampshades and lamp stands, and shopping bags.

Bristles produced at Wolfen were used exclusively in the brush industry, although experimental sieves and grids have been woven. The application of the bristles was confined mainly to domestic brushes, for whilst the chemical resistance is good the material collects so much static charge that there is a danger of fire if any volatile solvents are being used. The p.v.c. bristles are said to compare unfavourably with vegetable fibres as regards cost and service.

B.I.O.S. Final Report 1001.—Chlorinated polyvinyl chloride (Igelit PC) was made by the I.G. at Bitterfeld, and supplied to Wolfen in the form of granular powder for spinning by a wet process into a continuous staple fibre. Manufacture was on the scale of 120 tons per month. Apart from the production of fibre, a little of the product found use as a lacquer, as an adhesive for p.v.c., and as a film-forming material. A full description of the Igelit PC plant, together with a drawing showing arrangement, and lists of equipment, forms the main body of this report.

B.I.O.S. Final Report 1699.—This report deals briefly with the bonding of rubber to aluminium and its alloys, and the bonding of rubber to various metals by means of Desmodur R.



Progress in Scales and Slide Rules

NOTABLE improvements in the dimensional stability of scales and slide rules are foreshadowed by the results of tests carried out at the National Physical Laboratory on such articles produced from Bakelite laminated, compared with examples made from traditional materials such as boxwood and mahogany.

A series of scales and side rules using Bakelite laminated is now in production by Blundell Rules, Ltd., of Luton, and one of the standard 12-inch scales was submitted to the National Physical Laboratory for comparative tests to determine the dimensional change when subjected to extreme conditions of humidity.

The tests extended over a period of three weeks, and included the Blundell scale, good straight-grain specimens of new boxwood, old boxwood, and boxwood-ivorine. For one week these scales were subjected to an atmosphere of 95 per cent. humidity, being then immediately transferred to an atmosphere of 25 per cent. humidity for 12 days, returning to the original 95 per cent. humidity for one day. Dimensional changes on each type of scale were recorded daily and the results summarized by totalling the range of variation. The accompanying table gives the actual figures obtained in these National Physical Laboratory tests.

Disparity in the resulting figures was remarkable in that the range of variation shown by the Bakelite laminated scale was only 0.003 in., the comparative results for the other test specimens being: New boxwood 0.017 in., old boxwood 0.014 in., and boxwood-ivorine 0.033 in. Further, by reference to the accompanying table, it will be seen that the small changes which occurred in the Blundell scale took place wholly in the course of a day or two.

On the grounds of stability, which may reasonably be considered as the outstanding requirement for scales and measuring devices, Bakelite laminated in this use

Table 1.—Changes in Length with Change of Atmospheric Humidity for Scales made in Bakelite and other Materials.

	Day of Test	Bakelite	New Boxwood	Old Boxwood	Boxwood-Ivorine
Initial length under normal conditions.	1	inches 12.000	inches 12.000	inches 12.000	inches 12.000
Scales placed in atmosphere of 95% humidity on 1st day.	2	12.001	12.005	12.001	12.007
	3	12.001	12.006	12.002	12.009
	4	12.002	12.007	12.001	12.013
	5	12.002	12.006	12.002	12.013
	7	12.002	12.006	12.002	12.017
Scales placed in atmosphere of 25% humidity on 7th day.	8	12.001	11.993	11.994	11.995
	9	12.000	11.992	11.992	11.991
	16	11.999	11.990	11.986	11.984
	20	11.999	11.991	11.989	11.986
Scales placed in atmosphere of 95% humidity on 20th day.	23	12.001	12.006	12.002	12.012
Range of variation.		0.003	0.017	0.014	0.033

has, therefore, been established as being superior to natural materials. As regards all-round strength and durability, the laminate is also superior; it has a specific tensile strength comparable with steel, a high cross-breaking strength, and is non-brittle. More important still, it is consistent in its properties and does not require ageing to achieve stability, and being impervious to rot, attack of insects, and corrosion, the durability of the rule is indefinite. While under test in the moist atmosphere the boxwood scale became covered with patches of mildew, but no such infection could be detected on the Bakelite laminated.

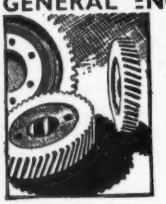
In the new Blundell scales and slide rules various interesting design features may also be noted. The graduations appear on a pure white ground, which is itself based on synthetic resin permanently fused to the Bakelite laminated blank, thus providing a dense, hard surface which is resistant to knocks, grease and water.

In the slide rules a neat tensioning device has been incorporated. This patented feature allows for the tension to be adjusted by means of two springs, which are readily accessible. In the 6-in. slide rule, the overall dimensions of which are too small to allow for the incorporation of the device, small brass studs are fitted where necessary to ensure correct grip between body and slide. As one of their minor attributes, the new rules made from Bakelite laminated have a pleasant "feel."

INDUSTRIAL FINISHING.—The first National Exhibition of Industrial Finishing in Great Britain will be held at Earls Court, London, August 31 to September 13, 1949. The decision to hold such an exhibition grew out of investigations, by the Council of Industrial Design, on the inter-relationship of finish, design, service conditions, and cost, as they affect the consumer of goods and machinery. It was found that the failure of finishes was more often due to ignorance than to bad workmanship, and that designers and manufacturers frequently selected finishes which were unsuited to the shape and service conditions of the component. The forthcoming exhibition will enable industrial users of finishes, the distributive trades and the general public, to see for the first time under one roof the wide variety of finishing processes which are now available. Inquiries regarding the exhibition should be addressed to Exhibition Secretary, 26, Old Brompton Road, London, S.W.7.

World's Industry Employs Plastics

GENERAL ENGINEERING



Ball bearings.—For high speeds, lightweight plastic retainers of laminated cotton textile (rolled tubing) give superior results compared with metal rings. Abrasive materials should not be used as laminates or fillers. For temperatures below 275 degrees F. (135 degrees C.), phenolic compositions are recommended. (" Machine Design," 1948/Dec./122.)

Frictional characteristics of O-rings have been investigated by L. E. Cheyney, W. J. Mueller and R. E. Duval (A.S.M.E. Advance Paper, 48/A/64 (1949). The testing apparatus consisted of an actuating rod which was drawn through a stationary O-ring. One type of hydraulic fluid and one typical size of ring were used for all tests, except those on the effect of ring size. The effect of the following variables were studied: Pressure, time delay, squeeze, stroke speed, ring size, and surface finish of rod.

Accident prevention.—A simple guard for a large squaring shear consists of a " Plexiglas " strip, $\frac{3}{8}$ in. by $\frac{1}{8}$ in., fixed to the front hold-down, which has been milled down for the reception of the strip. (" Machinist," 1948/Jan. 1/1168.)

Low-pressure laminates.—The various methods of producing low-pressure laminates are described by J. S. Trevor, who distinguishes three main techniques: Blanket, rubber bag and hat box. (" Machinery Lloyd," 1949/Jan. 22/53.)

Corrosion-proof pipe of " Kralite," a blend of synthetic rubber and thermoplastic resin, serves for chemical, mining, manufacturing and other industries. It is supplied by United States Rubber Co., Rockefeller Centre, New York, in rigid and semi-rigid forms, from $\frac{1}{4}$ in. to 2 ins. diameter. (" Engineering and Mining Journal," 1948/Dec./117.)

Valve seats.—A new nylon material combines good wear resistance with pliability. It has many of the properties of rubber has also good chemical resistance to hydrocarbons, and is recommended as seating discs for low-pressure valves and gaskets, which must remain flexible when contacted by petrol. (" Machinery," N.Y., 1948/Dec./184.)

MISCELLANEOUS

Mirrors and lenses.—J. M. Holeman assesses the good and bad sides of plastic optics for the amateur optician and gives information on how to work these materials. (" Scientific American," 1948/Dec./58.)

Industrial gloves made in p.v.c. (James North and Sons, Ltd., Godley Mills, Hyde, Cheshire) provide high protection and high durability in plastic plants. They are claimed to last four times as long as rubber when handling sodium cyanide, 7 to 8 times in caustic processes, and 5 to 20 times in handling solvents. (" Electroplating " (Supplement), 1949/Jan./62.)

Tyre casings.—The special problems set up by the use of artificial fibres in tyre casings are discussed by J. W. Illingworth, who deals with " Tenesco," cuprammonium rayon, " Fortisan," fibreglas and nylon. The latter is said to be superior to viscose rayon in strength, fatigue life, and moisture effect, but is inferior in creep properties. (" I.R.I. Trans.," 1948/Aug./59.)

Fibreglass textiles.—Owens - Corning Fibreglas Co. has brought out some heavy-textured marquisettes for use in hotels, offices and restaurants. Similar fireproof material is made for home use; this is finer in weave, washable, and easy to handle. (" Business Week," 1948/Dec. 25/48.)

Phenolic applications.—A chart in slide-rule form serves as a pocket reference for specifying plastic materials. It covers the phenolic materials made exclusively by Durex Plastics and Chemical Inc., North Tonawanda, N.Y. As the slide is pulled to the desired application, the material number recommended appears in one of the cut-out windows, accompanied by data on physical properties. The back contains engineering tables. (" Machine and Tool Blue Book," 1948/Dec./262.)

Synthetic rubber tyres.—Laboratory abrasion test revealed the formation of a tacky viscous material, which is usually removed by contact with the road before appreciable abrasion occurs. The main cause for the viscous film is probably depolymerized rubber developed during vulcanization. (" Anal. Chem.," 1948/ Sept./837.)

Cold rubber.—Arthur D. Little Inc. announce a new process which speeds up the production of synthetic rubber. In it the raw materials combine at from 0 to 41 degrees F., instead of at 122 degrees F. Such rubber may compete with the natural on the basis of quality. (" Mechanical Engineering," 1948/Sept./763.)

New designations and classifications of plastics are suggested by R. Nitsche and H. Heering. It is recognized that the German expression " kunststoffe," i.e., synthetic or artificial material, is not significant for the specific purpose. The word " polyplaste " is therefore suggested, demonstrating that the materials are derived from polymers and polycondensates, the word " plaste " already being used internationally in plastics, etc. Classification is carried out according to chemical characteristics, the following main groups being suggested: Carboplaste (polybutadiene), carbooxyplaste (cellulose derivatives, phenolic resins, shellac), carbazoplaste (cerbamical resins), carbthioplaste (thioplastic), siloxyplaste (silicones). (" Kunststoffe," 1948/Sept./ 173.)

Mould temperature control. — By pumping oil through the mould at a predetermined temperature which is thermostatically controlled, accurate heat control is provided for the moulding of thermoplastic materials, such as polystyrene, butyrate, nylon, and p.v.c. (" Machine Tool Review," 1948/Nov.-Dec./126.)

Building Interiors.—The Catalin Corporation of America is investigating the large-scale use of plastics as architectural, structural and decorative materials. Up to now only small use has been made of plastics in such applications as wall and floor coverings and furniture. The Corporation's new division, Plastic Interiors, will install and study complete plastic interiors. All plastic products which lend themselves to structural and decorative applications, including fabrics, lighting installations, furniture, matching accessories, wall panels, floor, bathroom tiling and fixtures, will be covered.

High-temperature polystyrene.—A new polystyrene composition (Chemical Division of Koppers Co. Inc., Pittsburgh, 19), P-8, is intended for products exposed to fairly high temperatures. A wide range of colours is available, colour stability is good, and mould shrinkage is low. Since it withstands boiling water, new compositions may be used for kitchen utensils, such as knife and fork handles. Radio cabinets do not warp under the heat of the valves. (" Business Week," 1948/Sept. 25/83.)

New Latex compound is said to take heat in processing; other characteristics are good chemical resistance, high tensile strength and good stretch qualities. This product (B. F. Goodrich Co., Akron, Ohio) is useful for textiles employed as industrial belting and oil-resistant gaskets. (" Business Week," 1948/Dec. 18/60.)

Non-corrosive thermoplastic.—Combination of synthetic rubber of the acrylonitrile group with a synthetic resin called " Versalite " gives a non-corrosive, though easy to form material, which is stable up to 220 degrees F. (" Product Engineering," 1948/Oct./176.)

Heat-resistant tubing is said to be suitable for temperatures up to 105 degrees C. during continuous use. Flexibility is retained after repeated baking, potting and soldering operations. The nature of the plastic is not stated. (" Product Engineering," 1948/Sept./171.)

Polystyrene.—Increased chemical and abrasion resistance of polystyrene is reported. After years of unsatisfactory experiments a low temperature surface cementation process (Logoquant) costing between 1¾ to 7 cents per sq. ft. has been developed. The article is either rapidly dipped or sprayed and then exposed to low-temperature fusion under infra-red lamps (95-105 degrees F.). The process is not highly critical and is completed in 15 to 20 mins. Mar resistance by silicon carbide grit falling from 25 ins., effecting surface transparency, is increased from 82 per cent. to 100 per cent. (" Materials and Methods," 1948/27/75.)

Price-volume ratios.—Block diagrams for 10 different plastics ranging from phenolics to polyamides show that the first range highest in the volume-price ratio with 134.5 cu. in./dollar, whereas polyamides range lowest with 19.3 cu. in./dollar. (" Materials and Methods," 1948/27/107.)

Foam rubber slicer.—A new bandsaw machine (Falls Engineering and Machine Co., 1734, S. Front Street, Cuyahoga Falls, Ohio) has been developed to speed the cutting of foam rubber into pieces for cushions, arm rests and vibration mounts. The bandsaw wheels, driven by 3/5 h.p. electric motor, are mounted in such a way that the saw blade moves horizontally. (" Business Week," 1948/July 31/38.)

Curing phenolic resins.—K. Hultzsch discusses the curing processes of phenolic resins; only quite recently has the mechanism of these processes been fully explored. The various kinds of phenolic-resin curing and curing conditions are summarized (" Kunststoffe," 1948/Apr./65.)

Rubber compounding. — Standard samples of compounding ingredients were inaugurated in 1943 for the U.S. Government's synthetic rubber programme, and attention is drawn again to six sample ingredients. (" Technical News Bulletin," 1948/Nov./135.)

Hydraulic systems identification. — Hitherto aircraft hydraulic systems were distinguished by wrapping 1-in. wide coloured cellophane strips around the tubes and covering them with transparent adhesive tape. A new alternative consists of sleeves of cellulose acetate butyrate, 0.025-in. thick and 1-in. wide, extruded in any desired colour. (" Product Engineering and Management," 1948/Nov./55.)

Moulding effects.—Dr. O. L. Pierson has investigated the effect of moulding conditions on the properties of acrylic resin parts. Based on this investigation the application of low temperatures for injection is advised. (" Product Engineering and Management," 1948/Nov./67.)

Nylon filter cloths are now specially manufactured in the U.S.A. (Filtration Engineers Inc., 155, Ovaton Street. Newark 4, N.Y.) to fit rotary vacuum or pressure filters. The material has high resistance to acids, alkalis, and bacterial action. (" Business Week," 1948/Nov. 27/62.)

Moulding compound, Plaskon Alkyd, is a fast curing thermosetting resin, reducing production times from minutes to seconds. (Libbey-Owens - Ford, Nicholas Building, Toledo 3, Ohio). Curing time necessary for ordinary thermosetting materials range from 1.5 to 15 mins. and are reduced with the new compound to about 25 secs. The new resin is an alkyd polymer combined into a mineral-filled moulding powder, for temperatures 275 to 325 degrees F. (" Business Week," 1948, Sept. 25/83.)

Paris—Plastics Exhibition

CONCURRENTLY with the Plastics Congress, which we reported in the February issue of this journal, an excellently conceived exhibition entitled "Plastiques 49" was held at the Pavillon de Marsan, a part of the Louvre. On January 27 delegates and friends *en masse* occupied the building, where in a number of lovely rooms a great range of plastics objects was on view.

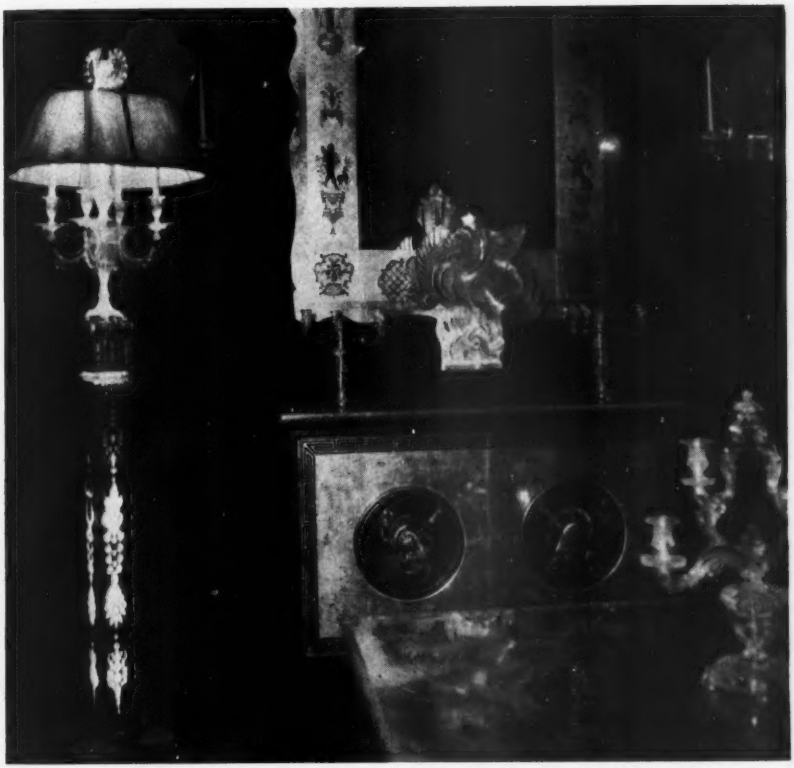
It may be as well to remind readers that owing to the war years, which meant complete cessation of supply of many raw materials and extreme shortage of labour, recovery had been slow. Nevertheless, 1947 production was 23,000 tons, which, although less than a third of British production and a much smaller fraction of American production, was twice that of 1938-9. That certain shortages still exist is obvious from the fact that it is forbidden to use phenolic resins for many jobs other than electrical and certain strictly industrial applications. Thus fancy goods, boxes and other containers for packaging, toys, many impregnated papers, etc., must not be made with phenolics.

In spite of these handicaps, technique remains as high as ever, and this was reflected in the quality and variety of the products on show.

As will be obvious from the above, phenolics were not greatly in evidence, except for electrical units, motorcar parts, and as laminates, gear wheels and "Jabroc" forms. Urea and melamine resins were seen in tableware and containers, while a large three-leaf screen by S. Bott in urea laminate attracted much attention. Most of the thermoplastics were represented, of special interest being nylon-coated wire, nylon electric mouldings and nylon nuts and bolts. There was also plenty of p.v.c. extrusions and sheetings, including finely printed tablecloths.

A special little section was devoted to the metallizing of plastics for decorative purposes. This work appears to be a speciality of

"Miss Plastic," wearing a plastic dress, examines a chart showing the chemical relationship of the components.



Decorative work in "Plexiglas" (S. A. Alsthom), by Charles Bouy.

Relec, 73 Boulevard Haussman. Another novel exhibit was the use of metal decorative "inserts" in the vertical sides of beakers.

It may appear quite fantastic, but the most outstanding and attractive exhibit was that of decorative art using methyl methacrylate as a medium. A whole room showed the work of one man, or rather, his atelier, Charles Bouy, of 137 rue de Sevres, and while in our opinion it overstressed the importance of the material as compared with other plastics, yet the objets d'art were so wonderful as to deserve the most extravagant praise. The accompanying photograph shows only a small part of his exhibits.

Both British and American exhibits were also on view, the latter comprising some of the prizewinners of the "Modern Plastics" competition held last September. Among the British exhibitors were Bakelite, Ltd., Warerite, Ltd., British Industrial Plastics, Ltd., British Moulded Plastics, Ltd., and Runcolite, Ltd.

Nor must we forget a little side-show that was seen at the Invalides railway station. Here there was on view an engine and carriage which has travelled some 30,000 km. on the Montauban run. It was lined entirely with a turquoise-blue laminate made by De La Rue Insulations, Ltd.

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Cellulose Acetate Plastics

XIX.—Container Fabrication

By
Vivian Stannett

THE largest single outlet for transparent cellulose acetate film and sheet, in the thickness range of 5 to 15 thousandths of an inch, is undoubtedly the manufacture of rigid containers. The use of these transparent containers is growing rapidly, so that to-day their manufacture has become a specialized industry in its own right. This growth is reflected in the number of commercially available machines which have been designed exclusively for transparent plastic container manufacture. These machines represent a recent development, and, up to a year or so ago, the few container manufacturers which did exist used machines of their own design and manufacture.

At the present time nearly all fabricated transparent containers are made from cellulose acetate, and there seems little likelihood of serious competition for some years, although small numbers of containers made from ethyl cellulose, vinyl copolymers, and also drawn from polystyrene film, have been marketed in the United States.

Transparent cellulose acetate containers can be grouped broadly into the following four main classes, according to their general method of manufacture: (1) Seamed fabricated, including cylindrical and rectangular; (2) spiral wound; (3) deep drawn; (4) solvent dipped. Many complete containers are made up also by

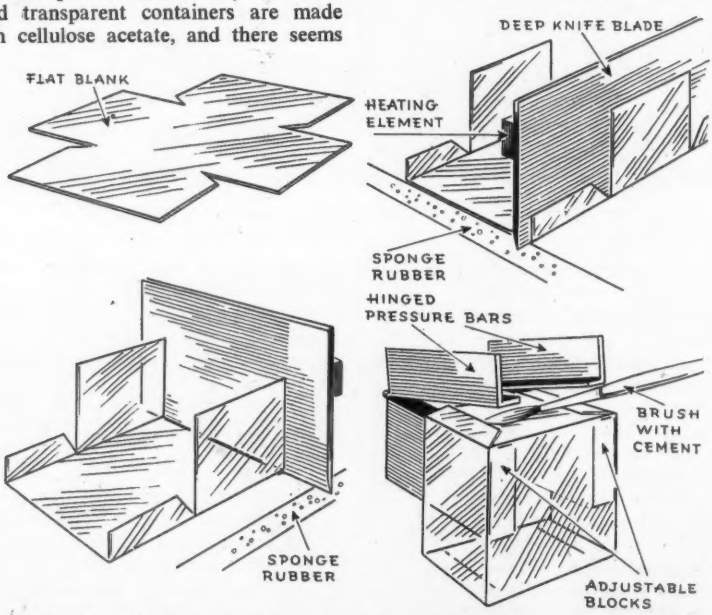

Fig. 1.—Stages in making a rectangular container. (Courtesy, Monsanto Co., U.S.A.)

a combination of two or more of these methods.

For the rectangular seamed container film of from 4 to 15 thou. thickness is normally used. These containers are made by the following simple sequence of operations: Cutting, creasing, cementing. The essentials of the hand method are shown in Fig. 1. Cutting out the blanks is done by means of a guillotine, the corner cuts usually being done by a special corner cutting die. A large number of sheets can be cut in one operation with a well ground blade, the tolerance being of the order of 1/64th of an inch.

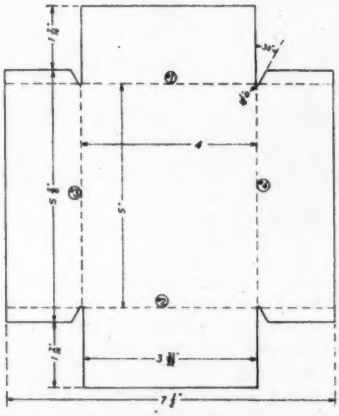

Fig. 2.—Blank for a rectangular container. (Courtesy, Harco Industries Inc., Rochester, N.Y.)

For mass production work it is often found advantageous to slit a continuous reel of film to one dimension, and then guillotine the strip to the other dimension. Complete cut-outs can also be made, including corner cuts, using steel rule type dies, although in this case it is not normally feasible to cut more than one sheet at a time. A double bevelled blade[1] is usual for guillotines roughly 30 degrees above the knife edge, followed by a further 25 degrees bevel. For continuous slitting the reel of film is run via a friction feed roll through rotary cutters distanced apart by spacers, and finally rewound into reels of the required width. Paper slitting machines can be adapted for this purpose. For very thin films of 3 thou. or less, fixed razor-blade slitters can be used. A specimen blank for a rectangular container is shown in Fig. 2.

Creasing

Creasing is carried out very simply by pressing down on the sheet with a heated blade, the sheet being supported by a rubber cushion along the lines of the bend. The angle of crease can be controlled by the depth to which the hot bar descends. A number of very efficient creasing machines are now available commercially, and two of these are shown in Figs. 3 and 7.

Cementing

All that remains to complete the container is to cement the overflaps and seals. Most container manufacturers use a brush or syringe to apply the cement, but cement applicators are now made commercially, such as those illustrated (Figs. 4 and 4a). To apply the cement by means of the applicator, the edge is simply run through the opening of the applicator. Finally, the seal is finished by gently pressing on an adjustable mandrel of the type shown in Fig. 5.

Fig. 3.—Modern commercial creasing machine. (Courtesy, Taber Co., New York.)

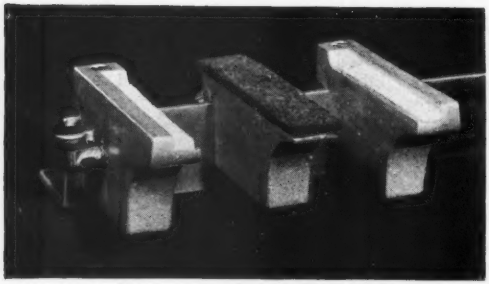

Fig. 4.—Double cement applicator. (Courtesy, Harco Industries Inc.)

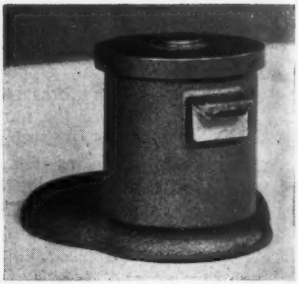

Fig. 4a (above).—Single cement applicator.

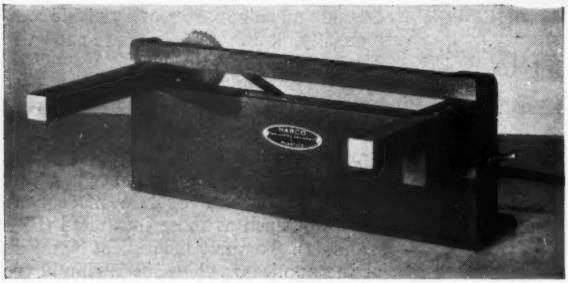

Fig. 5 (left).—A useful adjustable mandrel for cementing the corners of rectangular boxes. (Courtesy, Harco Industries Inc.)

Another design in commercial applicators involves a fountain-pen type of product with a small wick instead of the nib. This type is very useful for solvent adhesives. Sometimes hot metal-arms are lowered on to the seal to make a firm join.

Variations of the straightforward cut-out have been tried; some manufacturers use a separate bottom consisting of a simple rectangle, and the side piece flayed and creased from one piece with one cemented join. This type of box has the advantage that continuously beaded strip (see later) can be used to give a beaded top container, otherwise impossible with rectangular containers.

Another variation is the so-called X-shaped seal,[3] developed by Kodak laboratories. This has the shape of blank shown in Fig. 6. It is a much simpler box to handle during manufacture, but most users prefer the seams to be at the corners of the box. It derives its name from the fact that with the lid the seams form an X on each side of the box. A further variation of design for rectangular boxes is the cementless box[3] made by an ingenious method, each side being doubled over by 180-degree folds. This method has so far been little used commercially, partly owing to the extra material used in its manufacture.

The sequence of operations from the cut blank to the finished box is shown in Figs. 7-10. The lids of rectangular boxes are made in exactly the same way as the bases, only slightly larger all round; the

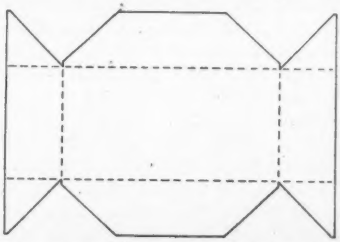

Fig. 6.—Outline of blank for an X-shaped seal.

Fig. 7.—The first creasing operation.

Making a rectangular container in cellulose acetate sheet. (Courtesy, Harco Industries Inc., U.S.A.)

same blank can be used for the lid and the base, but creasing about 1/32 in. larger all round. It is better to crease the bottom half of the box slightly less than 90 degrees and the lid slightly more. This causes a small bulging-out in the case of the bottom and a slight caving-in of the lid, leading to a perfectly fitting ensemble as shown in Fig. 11. To save material and for other reasons, lids are often made much more shallow than the base, and in this case, of course, separate blanks must be cut.

There is virtually no limit to the size of box which can be manufactured, except that the rigidity suffers with the larger sizes. The usual range is from 1 in. to 12 in. per length of side. Rectangular boxes are often all transparent, but using the separate flat-base method, described earlier, a card base can be used for cheapness and often gives added

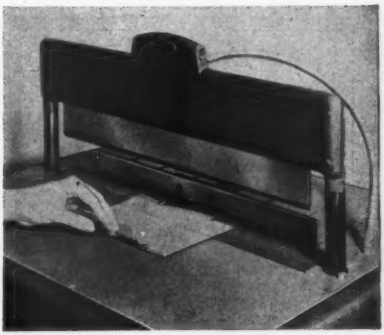

Fig. 8.—The second creasing.

Fig. 9.—Applying cement, using a double applicator.

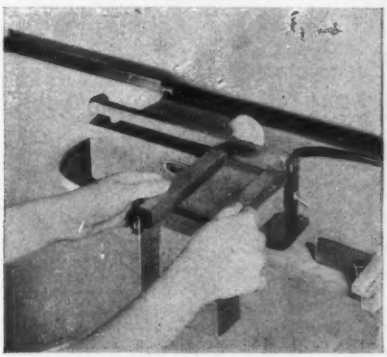

Fig. 10.—Fixing cemented flaps, using an adjustable mandrel.

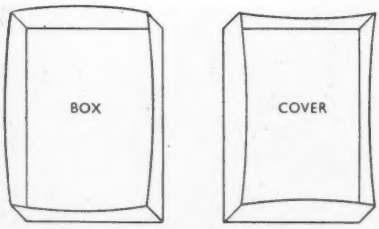

Fig. 11.—Preferred shape for box and lid. (Courtesy, Harco Industries Inc.)

rigidity. Many packs require a comparatively elaborate framed card base, and merely have a transparent rectangular lid to fit over the object to be displayed.

Good-quality very flat sheeting, free from residual solvent, yield the best boxes, which are free from any distortion during use. Modern cast and extruded commercial film, however, is normally free from serious distortion on keeping.

Envelopes

Envelopes, wallets and folders can be made by simply creasing a suitable blank over 180 degrees. This is carried out by a special folding creaser, essentially involving a hot bar flattening down the bend after creasing. The sides of such an envelope are then either cemented or sewn.

Cements

Owing to the poor solubility characteristics of cellulose acetate a wide range of adhesives is not possible. The most effective adhesive to use, in the writer's opinion, is undoubtedly acetone; this should be as pure and as dry as possible. If a thicker cement is required, it can be made by dissolving a little clean cellulose acetate film scrap in acetone. Occasionally acetone cements tend to dry out rather white in appearance, and this is best avoided by incorporating a few per cent. of ethyl lactate or diacetone alcohol in the mixture.

Most film manufacturers sell a suitable adhesive for this type of work, and it is often found to be worth while in the long run to use their cements rather than to rely on an adhesive of one's own manu-

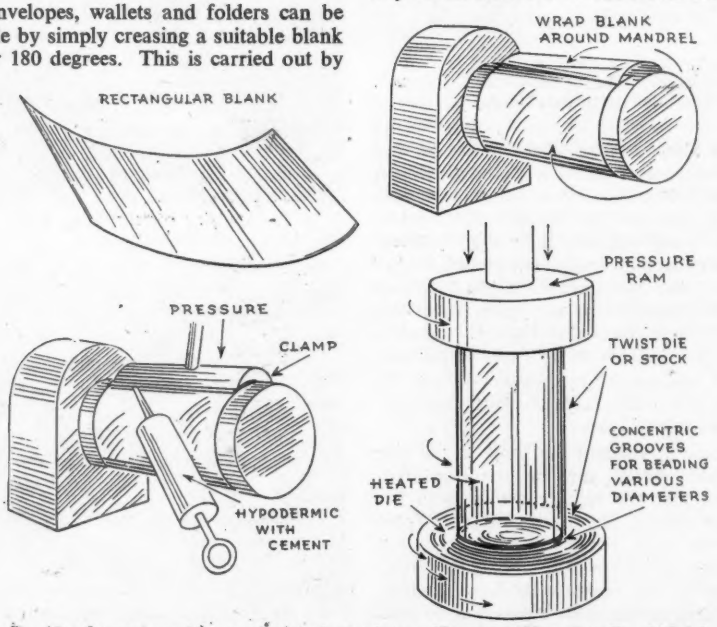

Fig. 12.—Stages in making a cylindrical container. (Courtesy, Monsanto Co., U.S.A.)

Fig. 13.—Applying the cement to the cut cellulose acetate blank.

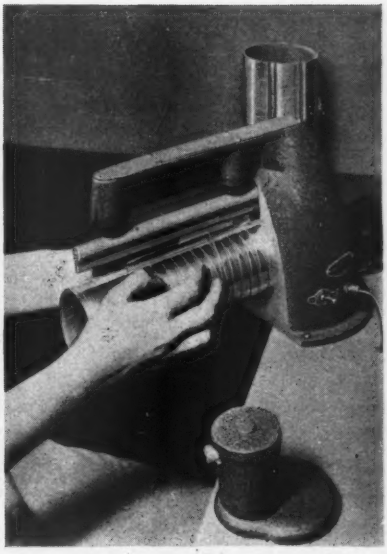

Fig. 14.—Fixing cement seal by treadle lowering of heated arm.

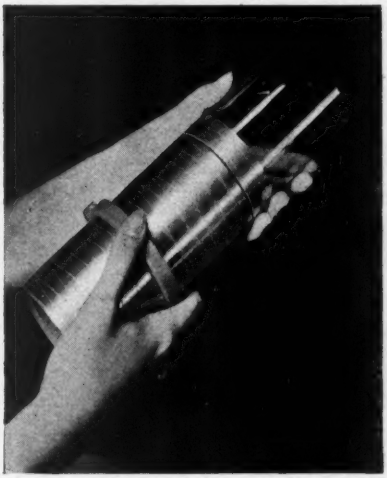

Fig. 15.—Placing cylinder over the beading mandrel fitted with spacing collar.

Fig. 16.—The operation of providing a single beading for the cylinder.

Making and beading a cylindrical container. (Courtesy, Harco Industries Inc., U.S.A.)

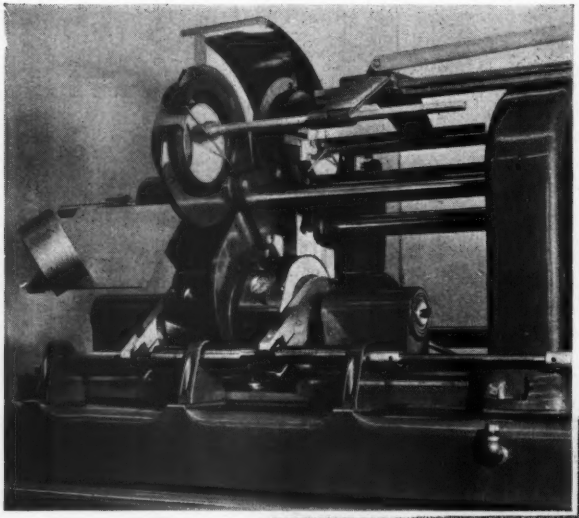

Fig. 17 (left).—Single-station beading machine for one or both ends. This machine takes cylinders from 1½ to 6 ins. diameter, with a maximum output of 30 cylinders per minute. It is automatic, except for feeding the cylinders on to the slide. (Courtesy, Taber Co., New York.)

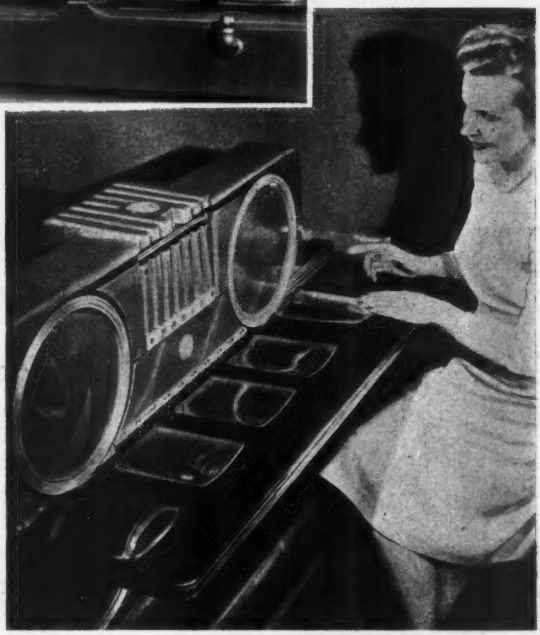

Fig. 18 (right).—Continuous single-edge beader, here seen in use with single cut pieces. (Courtesy, Taber Co., New York.)

facture. It is extremely important to keep the cements very well covered as they evaporate rapidly, even at room temperatures. Recently,[4,5] high frequency methods of sealing have been successfully used and look like coming into universal application for sealing rectangular containers.

Seamed Cylindrical Containers

The same gauge and quality of sheeting used for the rectangular container is also used for cylindrical containers. Essential steps in the manufacture are:—(1) Cutting the blank; (2) cementing the longitudinal join; (3) beading one or both edges; (4) fixing the circular base. The simple hand processes involved are illustrated in Fig. 12.

The blanks are extremely straightforward and consist of a single square cut, one dimension being the height of the container and the other the circumference

Fig. 19 (left). — Continuous double-side beading machine, with reel holder for continuous beading of roll material. (Courtesy, Taber Co., U.S.A.)

Fig. 20 (below). — Complete beading set-up as used for cylindrical containers. (Courtesy, Harco Industries Inc., U.S.A.)

plus $\frac{1}{4}$ to $\frac{1}{8}$ in. for overlap. The cementing is carried out either by brush or syringe on the mandrel, or by applicator prior to wrapping round the mandrel. Pressure can be applied by an automatic heated-arm device, or simply by hand. A fast-acting acetone cement will seal effectively in one second or so.

Cylinders are not often used straight, but are usually beaded at one or the other end; however, simple inexpensive containers can be made by merely sealing in a circular card disc at one end. For all transparent containers beading is necessary; it also adds considerably to the strength and appearance of the container. The beading can be carried out in two ways, the most usual at the present time is to hold the cylinder against a heated rotating metal die, ground at the correct diameter. This softens and moulds the edges over into an even bead.

The second method is to use a continuous beading machine, which beads either the cut blanks or the whole strip before cutting off the circumference dimension. This method has one or two attendant difficulties. Bending the bead is not always practical and may lead to kinking or a kicking-up of the bead; also, the joining edges must be telescoped together, which tends to be a labour-consuming process. However, for very large boxes, such as hat display boxes, continuous beading is essential.

Beadings can be turned inwards or outwards. Bottoms are usually given an inward bead in order to hold the bottom

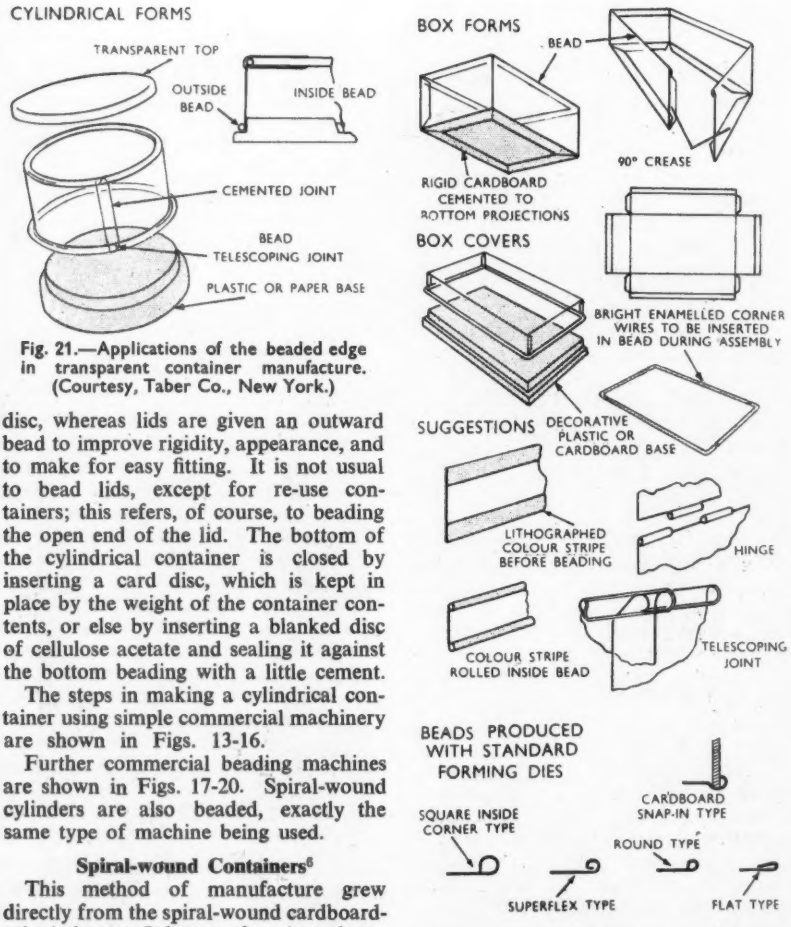

Fig. 21.—Applications of the beaded edge in transparent container manufacture. (Courtesy, Taber Co., New York.)

disc, whereas lids are given an outward bead to improve rigidity, appearance, and to make for easy fitting. It is not usual to bead lids, except for re-use containers; this refers, of course, to beading the open end of the lid. The bottom of the cylindrical container is closed by inserting a card disc, which is kept in place by the weight of the container contents, or else by inserting a blanked disc of cellulose acetate and sealing it against the bottom beading with a little cement.

The steps in making a cylindrical container using simple commercial machinery are shown in Figs. 13-16.

Further commercial beading machines are shown in Figs. 17-20. Spiral-wound cylinders are also beaded, exactly the same type of machine being used.

Spiral-wound Containers[6]

This method of manufacture grew directly from the spiral-wound cardboard-tube industry. It has not found much use for the transparent acetate containers at the moment, one reason being the slight loss of transparency resulting from the spiral seaming effect. On the other hand, it yields a strong, clear container, and is adapted for the mass production of containers, as the tubular part can be continuously formed and automatically cut-off to length. With the development of the automatic beading machine here illustrated, it can be seen that a very fast rate of production could be built up.

Thinner film is used for spiral-wound containers, the overlap giving the rigidity required. In addition to cylinders, square and hexagonal shaped, etc., can also be made by spiral winding technique. The spiral can be wound from either a single or a double strip.

In the first case, the strip is fed from a roll of width 2.2 times the diameter of the cylinder required. This is for a 45 degree spiral winding, which is nearly always used. The edge of the strip runs

over a wheel in a cement bath rather like a stationer's tape moistening wheel. It is then twisted once and led over a fixed polished steel mandrel, around which an endless rubber-covered fabric belt runs, the friction of the belt cementing the join between the overlaps and feeding the sealed cylinder along and off the end, where it can be cut to the required length.

The two strip method involves feeding one unglued and one glued strip on to the mandrel, things being arranged in such a way that the cement bearing strip is fed across the edges of the uncemented strip. The strips are heated by passing over a hot plate when thicker-gauge sheeting is used.

It can be seen that a very carefully co-ordinated system of feed rollers must be built up to make the spiral winding method yield a firmly cemented and attractive-looking product. However, once such an arrangement has been built, with reasonable facilities for adjustment of the various tensions involved, linear speeds of 6 ft. of wound cylinder per minute can be obtained. For square and other shapes the mandrel itself is allowed to rotate freely, the inequalities of pressure being taken up by using an endless belt with heavy rubber ribs. Finally, the cut lengths must be beaded and fitted with bases as before.

The lids for seamed and spirally wound containers may either be made in the same way as the bases, or drawn directly from sheeting as will be described in the next part of this series. The use of commercially available equipment has been stressed in this account, as it is fast becoming universal and this seems to the author to be in line with the natural development of the industry from the days when simple hand-made devices predominated.

(To be continued)

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NOTES FROM SOUTH AFRICA

A PLASTICS factory is to be established in Port Elizabeth by principals from Denmark. It is planned to produce buttons, combs, toys, domestic ware, and bathroom and kitchen tiles. Some of the 100 employees will come from Denmark and Norway.

Swan Plastics (Pty.), Ltd., 13, Meikle Street, City and Suburban, Johannesburg, are making a patented type of drinking fountain for poultry farmers. It is designed to permit the birds to have sufficient room to drink freely and at the same time prevents them from polluting the water by standing in it.

Mr. C. A. Steedman, the new manager of African Plastics Industries (Pty.), Ltd., Miller Street, New Doornfontein, Johannesburg, was previously technical manager of Lustroid, Ltd., Coatbridge, Scotland. African Plastics Industries is making a wide range of industrial mouldings.

Poly-Resin Products, Ltd., Woodbrook, East London, has been established to supply a range of synthetic resins, emulsions and allied raw materials to South African manufacturers.

PLASTICS IN HUNGARY

THERE was not much of a plastics industry in Hungary before the war, as the I.G. and the German chemical and plastics industry virtually ruled the market of Central and Eastern Europe. Progress in this respect in Hungary came after the war, when experts recognized that the moment had come to introduce machinery and raw materials from abroad. The Hungarian Three Years' Plan favours the development of this industry to save hard currency. It is now realized that plastics are not an "ersatz," but industrial products of full value.

The International Fair in Budapest in June last exceeded in volume and importance all previous Fairs, and the plastics industry was excellently represented. Visitors from the West were interested in partly finished goods; those from the East, where the plastics industry is not yet developed, were eager to buy finished articles.

It is planned to institute research into the possibility of utilizing massive reed growths on Lake Balaton as a source of cellulose, alternative to wood, in which Hungary is very deficient.

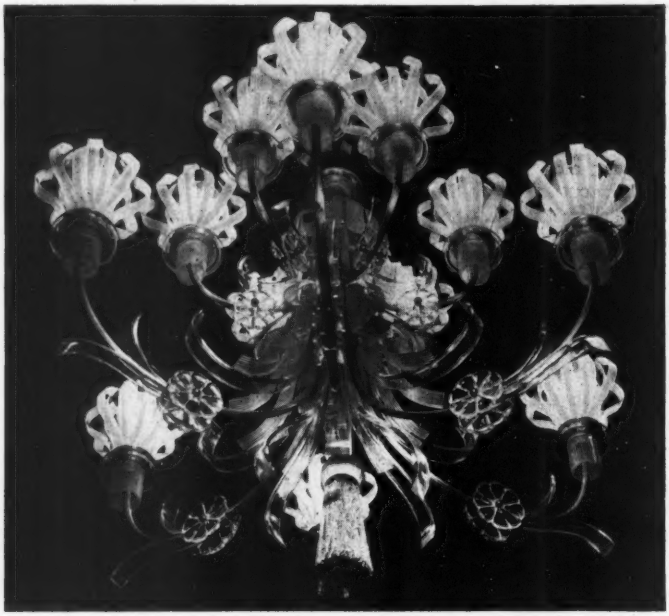


Fig. 1.—An elaborate two-tier 12-light crystal-type electrolier fabricated in "Perspex." (Courtesy, Falk Stadelmann and Co., Ltd.)

Suspended Lighting Fitments

CLUSTERS of suspended or hanging lights, as a means of illumination, first came into use in the 14th century. This new trend in lighting, which originated somewhere in the eastern part of Europe, did not necessarily develop from the candelabrum, whose use goes back to ancient Greece and persisted throughout Roman times. The candelabrum was in the form of a pedestal or shaft, which supported a group of lamps or candles. It became a common motif for decoration during the Italian Renaissance. Yet perhaps it was really a logical happening that the pedestal of the candelabrum was eventually and purposefully inverted to become the first chandelier.

It was in France that the craft of making these hanging lights developed most, and here also we find the origin of the word "chandelier." At first the fittings were made of wood; metal was substituted primarily to avoid disfigurement and possible ruin by the grease of the candles. The substitution of metal, however, also offered greater scope for form and decoration.

Compared with the candelabrum, the chandelier offered notable advantage in more effectively distributing light over the apartment. Ultimately, rock crystal, or alternatively glass, was used for decoration, mainly in the shape of prisms and faceted pieces, which were hung in pendant-like ropes. The introduction of these elaborately cut "lustres" as a constructional medium also brought a further advance in the fullest possible utilization

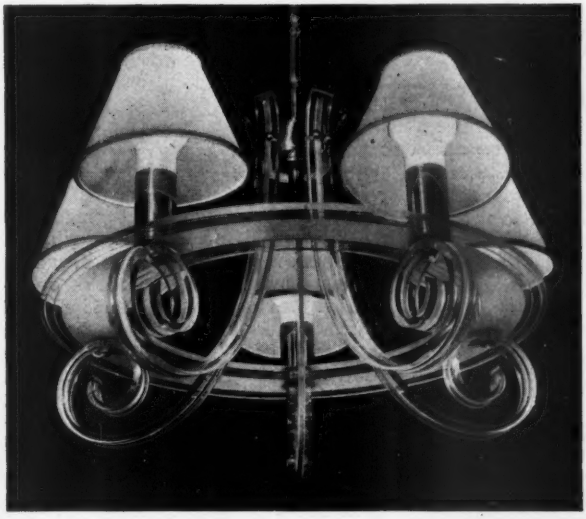


Fig. 2 (Left).—This lighting pendant is fabricated from "Perspex" strip, ¼ inch thick, with special grooves to house the wiring. (Falk Stadelmann and Co., Ltd.)

Fig. 4 (below).—Another example of the electrolier shown in Fig. 1, but with six lights only.

of the light-reflecting properties of the glass.

The glass chandelier, or rather its crystal prototype, first appeared in the second half of the 17th century. Popularity declined at the end of the 19th century, but during that interval the art and craft of making these fittings reached extreme degrees of lavishness, especially under the influence of such artist-craftsmen as Boulle and others in France, as

Fig. 3.—Two-light "Perspex" wall bracket. (Falk Stadelmann and Co., Ltd.)

witness the many magnificent examples which have survived.

With the substitution of electric light for candles, the chandelier is now spoken of as the "electrolier." One of our illustrations shows a two-tier 12-light crystal-type electrolier, which is the first of a series of such lighting fittings by Falk Stadelmann and Co., Ltd., of London,

(*Continued on page 163*)

Marking Processes and Media for Plastics—V

In the last instalment of this series, the author dealt with spray stencilling. He now proceeds to consider silk screen printing, which is widely employed for marking on a variety of base materials, including paper, textiles, metals and plastics.

By E. E. HALLS

THE screen printing process is one of the principal methods of applying patterns to p.v.c. sheeting, and the range of designs seen on this material is evidence of the usefulness of the process. A more technical application, in contrast to domestic uses, concerns "printed" electrical circuits, and confirms the reliability of the technique.

Silk Screen Printing

The silk screen process is really a stencilling method in which the inking medium is squeegeed through a silk screen and stencil on to the surface to be marked. The equipment required can be elaborated or simplified in accord with the nature of the work to be marked, and production requirements of quantity and rate of output.

The base of the equipment consists of a wooden frame, hinged to which is a second wooden frame accurately fitting the first. The silk screen is tightly stretched in the upper frame, and fitting flush to the under-surface of the silk is the stencil. The work to be marked is located in the lower frame with its operative surface flush with the stencil; cloth-like material is stretched and suitably supported, and rigid articles are held in appropriately designed and located fixtures.

In operation, with the stencil located and fixed in position, the work is loaded and located, and the upper hinged frame is lowered in position and locked. The "inking" medium is applied in excess to the silk, and drawn once with a rapid to and fro motion to cover the whole length of the stencil area, using a flat squeegee. This operation is very quick. The frame is unlocked and raised, and the work removed. The sequence of operations is then repeated. There is no need to remove surplus "ink" from the screen until the end of the run or end of the shift, or at meal breaks. The screen is then thoroughly cleaned with a solvent appropriate for the type of ink, otherwise the latter would dry in the interstices of the silk.

The type of silk used in this kind of machine is a stiff material generally known as Swiss silk or bolting cloth. Thickness varies from 0.003 to 0.004 in.; mesh from 145 to 91 threads per linear inch. The material for the stencils is often of special manufacture. In one silk screen equipment a duplex material is employed consisting of a film and a backing paper. The film is a hydrated type of paper or regenerated cellulose with shellac varnish on both sides, the overall thickness being about 0.0020 in. The backing material is a parchmentized or "oiled" paper, thickness approximately 0.0035 in.

The pattern to be marked is cut through the film, but not through the backing paper; in this way a rigid stencil is prepared that cannot be distorted and from which the centres of letters such as "O," and the like, cannot fall out. The stencil is then located on the underside of the silk screen, with film face in contact with the silk, and it is fixed in position by the simple process of hot ironing. Finally, the backing paper is peeled off and the stencil assembly is then ready for use. Obviously with this type of stencil, the solvents in the ink, and those used for cleaning, must not have any action on shellac. Alternatively, if inks

containing methylated spirit or acetone are to be used, the heat-adhesive on the film must be changed to suit these solvents.

It is evident that only one "colour" can be applied on the silk screen, but this does not prevent the production of multi-coloured prints. The work has to be passed to a succession of screens, all with accurate location, to cover the full colour range required, the successive stencils registering with exactitude, and each being cut for the portion of the pattern concerned with one colour.

For intricate patterns, and those involving tiny characters or fine lines, which it may be impracticable to produce by cutting, a photographic procedure may be adopted. Several methods are possible, a brief description of one being given by way of illustrating the rudiments of the process.

The silk screen is sensitized and the design is printed on it so that no additional stencil is required. For this purpose, the silk, which is a bolting cloth of about 150 mesh per linear inch, is stretched in its frame. The first step is to render it impermeable to the printing paste, using a light sensitive medium, such as the following:—

Fish glue	85 gms.
Le Page's belting cement ..	45 gms.
Ammonium bichromate ..	10 gms.
Albumen	85 gms.
Distilled water..	500 ml.

These ingredients are dissolved in separate portions of the warm water, and then mixed thoroughly, two or three drops of ammonia being added. It is kept for about 24 hours in a dark place to "ripen," and it is then ready to spread on the silk.

The entire process of coating the screen is done in a photographic dark room. The sensitizer may be brushed on, but great care must be observed to avoid brush marks, streaks or pin-holes. A preferred method is to "flood" the silk by supporting the screen in an inclined position, pouring the emulsion along the top edge and allowing it to flow down the screen. This is repeated several times. Then, with the screen horizontal, a straight-edge squeegee of length equal to the width of the screen, is moved up and down the screen until the coating is even and the emulsion has set. The inside of the screen is then similarly coated. It is dried in a current of clean air. If desirable, the complete process may be repeated to ensure uniformity of coating, absence of pin-holes, and to provide adequate strength of coating. Finally, the screen is allowed to dry for at least 24 hours, because the drier it is, the more sensitive it becomes to light upon exposure.

The design to be produced is drawn in the usual way and traced in opaque ink on transparent paper. Obviously, one design must be prepared for each colour that has to be printed; likewise, a silk screen for each. The designs must be opaque and free from pin-holes.

To take the exposure, the inside of the screen is spread with talc powder and covered with velvet or soft cloth, kept pressed in position by thick cardboard suitably weighted. The design is pasted face uppermost on a glass sheet, and the screen laid on it, so that the design contacts the sensitized surface. Exposure is achieved by providing a source of light beneath the glass plate.

A more convenient procedure is to spread the outer face of the screen with a thin layer of colourless grease and to place the design, inked face downwards, upon this. The design is then squeegeed to remove excess of grease and all air bubbles, leaving the tracing firmly pasted on the screen. The latter is then exposed to sun, arc, or electric light. Over-exposure must be avoided, as it makes developing difficult. This type of screen is golden brown when correctly exposed; from 30 to 60 mins. exposure is an indication of the time required for arc light, with shorter and longer times respectively for sun and electric lights.

After exposure, the cardboard, velvet and tracing papers are disassembled from the screen and the grease is washed by means of a cotton swab soaked in acetone.

The influence of the light is to render

the exposed portions of the ammonium bichromate gum emulsion insoluble in water. The unexposed coating is removed by dissolving it in a gentle stream of tepid water. If portions of it remain undissolved (which may be due to overexposure, or by permitting excessive time between sensitizing and exposing) it may be practicable to rub it away with a brush dipped in ammonia; but the screen itself must never be rubbed.

The coating is then hardened by immersion for 5 mins. in the following solution:

Water	4,000 ml.
Methyl alcohol	500 ml.
Ammonium bichromate	14 gm.
Chromic acid	1 gm.

The coating will be unaffected by paints containing turpentine, benzine, alcohol and oils. For protection against water and acids such as are contained in aniline dye pastes, enamelling is necessary both sides. An enamel paint is spread in a similar manner to that employed for the emulsion itself, and is removed from the exposed areas from the reverse side by use of a cotton swab soaked in benzine or other appropriate solvent. The process is repeated on the remaining side of the stencil.

Two other compositions for sensitizing emulsions, which must be prepared in a dark room and kept away from direct light, are given below:

Distilled water	8 fluid oz.
Ammonia (28%)	½ fluid oz.
Glycerine	5 gms.
Ammonium dichromate	10 gms.
Chromic acid	1 gm.
Photo-engraver's glue	4 gms.

The dichromate, chromic acid, glue and glycerine are dissolved in separate portions of warm water and then thoroughly mixed. The day before requiring to use the solution, 56 gms. of albumen dissolved in the minimum of distilled water is stirred in, the mixture is allowed to stand for 12 hours, then strained and used.

Process glue	100 ml.
Glycerine	4 gms.
Ammonium dichromate	6 gms. in 60 ml. of water
Distilled water	to make 200 ml.

This solution is strained and 5 ml. of 28 per cent. ammonia is added. It is then ready for use and will keep (in a dark room) for two or three weeks.

The inks normally used are virtually paints or enamels and are designed to give permanent bonds with thermosetting or thermoplastic materials. Alkyd resin-base types are preferred for the thermosetting materials, and both air drying and stoving media can be used. Smooth adherent markings are obtained with slightly raised characters. In the case of thermoplastic materials, the same inks, air dried, can be used, or solvents can be included to ensure slight mergence with, and sinking into, the plastic. This is preferred, on the whole, because it ensures that the plasticizers in the plastic cannot sweat out to form a layer between the base material and the marking, thus destroying its adhesion.

By ensuring a combination between the print and the material, the pattern acquires the same life as the base material. Experience shows that p.v.c. is one of the most difficult materials to cater for, particularly as this plastic from different sources may vary appreciably with respect to proportion of co-polymer, the nature and quantity of the plasticizer, and included lubricant. Hence, when a process has been worked out for the marking, it is important to lay down a specification for the p.v.c. with reference to these variables, and with particular reference to internal lubricants such as ethyl palmitate and paraffin wax.

The thickness of the stencilled film can be controlled, and for most purposes is within the range from a few ten-thousandths to five-thousandths of an inch; for special purposes, it may be as much as 1/32 in.

The special type of paper for stencils may be replaced by other materials; films of gelatine and nitro cellulose lacquer have been employed. The silk screen can in some circumstances be replaced by stainless steel or phosphor bronze woven-wire mesh, from 60 to 250 threads per in. according to the nature of the work and mode of operating. The inking medium may be forced through the screen by roller or by hydraulic pressure, instead of using a flat squeegee action.

The silk screen process has particularly

been developed in America in recent years to become an accurate means of applying multi-colour impressions to curved and flat plastic surfaces. The equipment required is relatively simple, and highly flexible and, if required, even with superimposed markings, an accuracy of plus and minus 0.005 in. of location can be provided.

Apart from the direct marking of material or articles, the screen process is used for making transfers, which may be of the varnish, slip-on, or heat-fixing types.

General Printing and Photo-engraving Methods

The silk screen stencilling method is probably the most widely used "printing" process for plastics, especially for p.v.c. sheeting. The gelatine transfer process already referred to can also be regarded as a normal printing procedure.

Photo-engraving methods depend upon a sensitized film being first formed on the plastic. This may be of gelatine, glue or albumen, or a combination of these, containing the ammonium dichromate type of sensitizer, as described above in the screen process. In some cases this can be enhanced by an additional layer of collodion sensitized by the cadmium iodide/silver nitrate process, or the latter may be used alone. The latter procedure really requires a nitrocellulose base, and in fact the process is used for printing scales on metal dials, the latter being first provided with a nitrocellulose film by spraying with an opaque cellulose enamel of appropriate colour. Actually this can provide an excellent means of printing dials and scales that need to be light in weight, accurate in printing, sharply defined, and "permanent" in life.

Hard aluminium or aluminium alloy in thin gauge serves as the base metal. It is degreased in trichlorethylene vapour and pickled in solution containing 15 per cent. by volume of sulphuric acid and 5 per cent. by weight of chromic acid for 20 mins. at 45 to 65 degrees C. This treatment ensures perfect adhesion of the nitrocellulose film, while the latter gives excellent protection against corrosion under damp conditions. The photo-printed scale can finally be protected with a thin coating of clear nitrocellulose varnish, which merges with the base coating and therefore adheres satisfactorily.

An American Navy patent uses the photo-engraving process for methacrylate resins. In this process, the sheet is cleaned by washing in methanol and polishing with a suspension of slaked lime. The surface is then sensitized with an ordinary gelatine emulsion containing ammonium dichromate and potash alum. The negative is placed in contact with the sensitized surface and submitted to intense exposure from a photo-engraver's lamp. Developing follows, in water, which washes out the non-hardened areas, leaving a stencilled pattern of the positive. This can finally be coloured with one or more dyes from appropriate solvent solutions.

Another unusual method which has been used for printing codes on ebonite, and scales on flat and cylindrical plastic surfaces, uses a rubber master. Briefly, the process involves a primary master in the form of drawing or blue-print. This is transferred to a metal plate by the usual gelatine/bichromate photo-etching procedure. The rubber master is formed directly from this, and is moulded on and vulcanized to a perforated zinc sheet. This master print is used for marking flat and curved surfaces, and is claimed to be practical within an error of 0.002 in.

The type of ink is chosen to suit the nature of the material to which the print is to be applied, and the mechanism is the normal one of picking the ink up on a roller, smoothing it to an even layer of the required thickness, and next transferring it to the master, and finally to the job.

Printing by any of these methods can be used for the specially patterned papers that form the top surface of thermo-setting resin boards of decorative or otherwise marked variety. Timber grainings are commonly produced in this

Table 1.—Air-drying Oil-modified Synthetic Resin Enamels for Spray Stencil Application.

Colour	Red	Blue	Yellow	Green	Black
Volatile spirit (loss in wt. 3 hrs. at 110°C. per cent.)	60.4	43.5	39.3	39.8	79.0
Total Solids (per cent.)	39.6	56.5	60.7	60.2	21.0
Viscosity at 25°C., (centipoises)	470	1,380	670	910	20
Specific gravity at 25°C.	1.363	1.332	1.492	1.392	0.895
Surface drying time..	½-hr.	½-hr.	½-hr.	½-hr.	10 mins.

manner. The paper is subsequently impregnated in the appropriate thermo-setting resin (phenolic or amino), and forms the top sheet in the pile that is heated under pressure between platens to give the final board.

Direct Transfer Methods

The general method of marking intended under this heading is the direct marking by the application of ready-prepared transfers. The process is particularly apt for mouldings, especially the phenolic, for the application of the supplier's name or trade mark, patent or serial numbers, working instructions and the like. The marking can be in any colour, including the metallics, such as copper, gold, silver, etc., and within reason there is no restriction to the size of the characters or the design. The transfers can be purchased cut to size as individual transfers or in continuous lengths in rolls or pads.

In their simplest form, transfers, or decalcomanias as they are often termed, use a paper coated on one surface with a water-soluble paste or gum as the foundation. The required design is printed on this gum film base. When the transfer is moistened and pressed against the surface to which it has to be applied, the coating softens and permits the paper to be removed, leaving the printed design on the surface. Modifications are made to this general construction in accordance with the type of transfer required, namely, directly applied, slip-on variety or varnish form.

Two types of transfer paper are commonly used, simplex and duplex. The simplex can be prepared from a good, smooth, book paper by coating with a thin solution of starch and gum. Two coats are applied, with proper drying and "seasoning" before printing. The duplex paper uses a fairly heavy, smooth, white paper, and to this is attached a thin tissue paper with a thin paste solution; when dry, the face of the tissue is coated with a solution of paste and gum arabic.

The slide-off, the direct, and the varnish types of transfer can all be printed by the silk-screen process. Either of the papers can be employed, and it is customary to use simplex paper for slide-off transfers and duplex for varnish types. The silk-screen technique is as already described; printing medium can be quick-drying lacquer or gloss oil-base colours, and, in fact, almost any paint, varnish or lacquer, adjusted to appropriate consistency, may be employed. In some transfers a lacquer print only is used, while in others a long oil type of enamel is stencilled between two applications of lacquer. Again, a coat of transparent lacquer can be applied over the whole surface before and after printing the design on the paper. This gives a tough film, rendering the final applied marking more resistant to mechanical damage and resistant to moisture.

On slide-off transfers for opaque surfaces, the solid background is printed first and then the design or printing upon it, i.e., the design appears face uppermost For application to the inside of transparent surfaces the printing is in reverse. They are applied to the work by dipping in water for a few seconds, and placing paper side downwards on the surface to which to be applied. While still wet, the design is gently pressed down with the fingers of one

hand, while the paper is gently withdrawn from beneath the design with the other. The design must carry enough of the gum with it to secure it to the surface of the work.

Direct water-transfers are printed in reverse for application to opaque surfaces or to the outsides of transparent ones, and printed right side up for inside surfaces of transparent materials. A special adhesive completely covers the design when all the printing is complete. To apply them, they are dipped in water for a few seconds, then placed in position on the article with paper side uppermost and smoothed out with the fingers, a pad, rubber roller or squeegee. The backing paper is then removed.

Varnish transfers differ from the water varieties in so far as a coat of clear lacquer or varnish is applied to the paper by stencil or roller before the design is printed. This varnish coat must extend beyond the design on all sides by at least $\frac{1}{16}$ in. Another coat of this varnish is applied after all the colours have been printed. Slip sheets of paper are inserted between transfers to prevent them from sticking together in storage.

The varnish transfer is applied to the work by first coating the surface of it, or of the work, with a special adhesive varnish. As soon as this has become tacky, the transfer is applied (face downwards) and smoothed out. It is allowed to dry and then the backing paper is peeled off; finally, the tissue layer is moistened with water and slid off.

The water-type transfers are less resistant to humid conditions than the varnish variety; the permanence of both forms can be improved by the spray or brush application of a thin coat of lacquer or varnish. A cellulose lacquer, brushing transfer varnish, or spirit shellac solution, is suitable for this purpose. Characteristics of the cellulose type of transfer varnish are shown in Table 1.

(To be continued)

LETTERS TO THE EDITOR

Pearl Essence

Sir,—What is pearl essence, and is it made in this country? Are there other similar decorative materials for plastics?

Doncaster. A.G.A.

[EDITOR'S NOTE: Pearl essence is a "pigment" obtained from the scales of certain fish—the bleak, a small freshwater fish, is the only type mentioned in the literature. These scales are noticeably opaque, whereas the scales from most other fish, being of varying degrees of transparency, presumably depend upon polarized light for their "lustre." The bleak scales are washed in ammonia water, or are treated with diastases to break up the proteins and so free the brilliant pigment. For the production of artificial pearls from hollow beads, the "essence" is suspended in gelatine, which is poured into the bead and then removed to leave a thin layer. For plastics, the "essence" may be suspended in nitrocellulose lacquer. We do not know of other similar decorative materials, although bismuth oxychloride has been used. Lead iodide gives a golden spangle effect; this is easily made from any soluble lead salt and potassium iodide solution by boiling and cooling to obtain small iridescent golden-coloured crystals.]

In Appreciation!

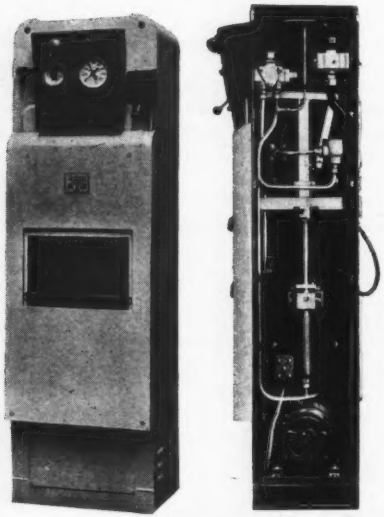
Sir,—We have pleasure in thanking you warmly for the set of your issues sent to us. If we understand rightly that this gift has been made by one of your readers, please also thank him on our behalf. Our office is engaged in helping Italian technicians in their task of reconstruction, and would be grateful for back numbers of any other British technical periodicals.

SERVIZIO DI DOCUMENTAZIONE TECNICA.
Rome,
Via Flaminia, 362.

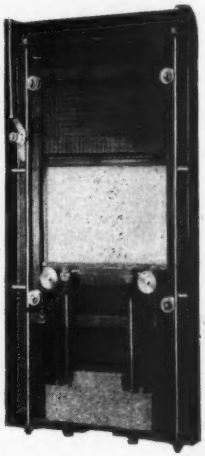
[EDITOR'S NOTE: The issues in question were given by Mr. Clement Saxton, of Northwood, Middlesex.]

PRODUCTION NEWS

Raw Materials, New Plant, Works Organization, Control Apparatus, Research, Personal and Trade Notes



(Left) The "Coborn" totally-enclosed plastics press, together with sectional view showing internal construction.



(Right) Details of the press guard mechanism.

NEW TOTALLY-ENCLOSED PRESS.—The 50-ton "Coborn" hydraulic press, recently introduced by George Cohen, Sons and Co., Ltd., Wood Lane, London, W.12, has been specially designed for the production of plastic or rubber mouldings. It is a totally-enclosed and self-contained unit.

The platen size is 17 ins. by 16 ins.; total loading 5 kW 200-230-volt single-phase; temperatures, controlled by thermostat, are adjustable from 200-450 degrees F. The main downstroke power is adjustable from 50 tons to approximately 10 tons. Working stroke with platens is 10⅛ ins. Return power (available for ejection) is approximately 3 tons. The ejection grid with 1½-in. stroke, is operated on the return stroke of the main ram. Speed of operation is 1 in. per second downstroke and 2 ins. per second upstroke. Cycle time, excluding curing or loading period, is approximately 15 seconds. The power unit is a rotary vane-type pump driven by 3 h.p. motor.

Arrangements have been made to prevent plastic powder being blown from the table into or around any of the working parts. A control panel is fitted with indicator lamps to show when the pump is running and when the platens are switched off. The press is controlled hydraulically by a single lever fully interlocked with the safety guard. The only connection required is a single cable on the electrical side.

One of the accompanying illustrations shows the construction of the press guard. The rising guard, carried on rollers, is counterbalanced and fitted with rubber buffer stops to eliminate noise as far as possible. The upper portion of the gate is interlocked with the control valve by a ball-bearing bell crank. The control valve has three positions: (a) lower press; (b) neutral; (c) raise press.

A cast-steel bolster plate is provided beneath the lower press platen to allow the fitting of normal pin-type ejectors. The whole of the ejector mechanism is lifted at the top of the return stroke. Heavy coil springs are put into compression when the table is raised to its maximum, and return the whole ejector mechanism when the table is lowered.

CARBIDE-TIPPED TOOLS.—Technical publication No. 121 of Firth Brown Tools, Ltd., Bessemer Buildings, Carlisle Street, Sheffield, 1, deals with "Mitia" Carbide Tips and Tools. It is essentially an instruction book of over 100 pages, providing terms

and definitions for single point cutting tools, and practical notes on the design, use and maintenance of such tools. There is special reference to the manufacture of tools by users who prefer to carry a stock of standard tips, to the grinding of tools, and the reconditioning of damaged tools. A short section on the drilling of plastics gives useful information. Illustrations throughout are excellent.

"HOLOPLAST."—Outstanding features of "Holoplast" material as a structural medium are outlined in a well illustrated manual of 68 pages issued by Holoplast, Ltd., New Hythe, near Maidstone, Kent. This general technical guide to users shows how this material can be employed to the best advantage. Prefaced by a considerable amount of technical data, including matters of safe distributed loads, radius of curvature, acoustic properties, reverberating sound absorption, weathering properties and resistance to chemicals, the remainder of the book is mainly devoted to details of application in shipbuilding; for walls, partitions, and bulkheads; ceilings; doors; windows; acoustic panels; and furniture. Illustrations of actual usage are also given. In addition, there is a special section on the manipulation of the material (sawing, grooving, planing, drilling, etc.), and on the use of adhesives. A detailed study of the contents of this publication is recommended.

LAMINATED PLASTICS APPLICATIONS.—Information Sheet 143, one of a series published weekly in the "Architects' Journal," February 10, describes the use of "Warerite" laminated plastics in the form of veneered boards and panels, and illustrates their uses for shop counters, table tops and flush doors. Four alternative edge finishes are shown for table tops made from "Warerite" veneered plywood. Flush doors use the conventional solid plywood or block-board cores, to the surface of which "Warerite" veneers are cemented. Alternative edge treatments of veneer and hardwood are shown. A previous information sheet illustrated the use of veneered boards and panels as wall coverings.

VARNISHED INSULATING MATERIALS.—The Micanite and Insulators, Co., Ltd., Walthamstow, London, E.17, have recently published an illustrated brochure dealing with "Empire" varnished insulating materials, which originated in 1895 by their American associates, the Mica Insulator Co. These materials include varnished cotton cloth, silk, glass, canvas, duck, paper and tubing. They are all flexible, oil and moisture resistant, and can be obtained either as sheet (36 inches wide), in continuous rolls, as tape of any required width, or as small diameter tubes. Available thickness also covers a wide range, so that the correct material can be selected for every possible application. There is now no difficulty in providing seamless bias tapes which will give a definite minimum extension under load. A companion publication deals with "Micanite" built-up insulation.

DURATUBE AND WIRE, LTD., informs that Mr. J. W. Tydeman, manager of their Export Department for the past two years, has now taken up the duties of general manager, which became vacant owing to the death of the late Mr. Julius Veit. Mr. Tydeman commenced his career with the National Telephone Co. and British Post Office, and was with the latter until after 1918. He then joined the Western Electric Co., as branch manager in South Wales; later he was with Standard Telephones and Cables, Ltd., and in 1934 became sales engineer to the tele-communications transmission side of that company.

INSULATORS, LTD.—A dinner and dance, given by the directors, was held at Frascati's Restaurant, London, on January 7, to some 200 of the staff and their friends, who not only dined and danced but also thoroughly enjoyed one of the best cabaret shows it has been our pleasure to see. Mr. Charles Waghorne, director, welcomed the guests, and Mr. C. C. Last (of Bakelite, Ltd.) replied on their behalf and amused his audience with reminiscences of the early days of Insulators, Ltd., in the field of plastics manufacture.

BRITISH INDUSTRIAL PLASTICS, LTD., announce that Mr. John E. Beard has been elected to the board. Mr. Beard is managing director of B.I.P.'s subsidiary company, The Streetly Manufacturing Co., Ltd., and will retain that position.

TUFNOL, LTD., inform us that the late Mr. H. W. Rowell, a vice-president of the Society of Chemical Industry, was a member of their staff in the days when the company was known as Ellison Insulations, Ltd.

ASHDOWNS, LTD., St. Helens, Lancs, have concluded an agreement with the St. Regis Paper Co., New York, covering their patents and technique relating to "Panelyte" laminated plastics. They will manufacture and sell these products under their own trade name of "Ashlam," and will shortly extend the range by the inclusion of the special

refrigerator grade, which has been adopted in the United States for inner door linings, breaker strips, etc. There will also be many applications for flat and formed laminated paper and fabric grades in other industries.

AERO RESEARCH, LTD., have now reprinted the first 60 issues of their "Technical Notes" in the form of a bound volume, which will prove particularly useful as a reference book on problems involving the use of synthetic resin glues and gluing technique. The issue of these notes commenced in January, 1943. The bound volume is obtainable from the company's Technical Service Department, Duxford, Cambridge, price 30s. Issues of "Aero Research Technical Notes," No. 61 and onwards, are still obtainable free of charge, and the company will be glad to arrange for future issues to be sent each month to any readers of "Plastics" who wish to keep in touch with the latest developments in modern synthetic resin glues.

RUNCOLITE, LTD., 3, Vere Street, London, W.1, have sent us a copy of their publication, "Design and Enterprise," which has a special foreword by Mr. W. J. Fischbein, managing director of the company. This is the company's first post-war export catalogue. The foreword stresses that design has three meanings in the Runcolite enterprise—first, to plan for mass production; secondly, the selective pattern of distribution; thirdly, but by no means least important, the design of the product.

TELEGRAPH CONSTRUCTION AND MAINTENANCE CO., LTD., inform us that the telephone number of their Telcon Works has been changed from Greenwich 1040 to Greenwich 3291.

WILD-BARFIELD ELECTRIC FURNACES, LTD., inform us that the address of their Sheffield Office and that of their associates, G. W. B. Electric Furnaces, Ltd., is now 4, Paradise Square, Sheffield, 1.

NEWMAN INDUSTRIES, LTD.—The London Office of the Electro Motor Division of Newman Industries, Ltd., is now at 49, Park Lane, W.1. (Telephone: Grosvenor 4905-9.)

BECK AND POLLITZER, LTD., shipping, forwarding and insurance agents, have extended their activities to South Africa. A subsidiary company, under the style Beck and Pollitzer (Africa) (Pty.), Ltd., is now established at 3 Yorkshire House, Cr. Marshall and Rissik Streets, Johannesburg, South Africa. (Cable address: "Hookup," Johannesburg.)

MR. L. G. BRAY, formerly of C. H. Parsons, Birmingham, has left Luxor Metal and Plastics, Ltd., and has joined the staff of A. B. Metal Products, Ltd., in the capacity of works manager.

MR. A. T. BIRKBY, joint managing director of Birkbys, Ltd., passed away on Sunday morning, February 20, after an illness. He was 67 years of age.

NOTES FROM BRITISH PLASTICS FEDERATION

Moulders Group

A successful dinner dance was held by the Moulders Group at the Dorchester Hotel, London, on February 2, when 225 guests attended.

Post-War Building Studies

The Ministry of Works published Post-War Building Studies No. 3, "Plastics," in 1944. This publication was compiled by the Federation, who have now been requested to undertake a revision before it is reprinted.

FORTHCOMING MEETINGS

Mar. 11.—"Optical Plastics." D. Starkie. Plastics Institute, Scottish Section.

Mar. 15.—"Polyvinyl Chloride Pastes." D. L. Clarkson and N. D. MacLeod. S.C.I., Plastics Group. Manson House, 26 Portland Place, W.1.

Mar. 16.—"Cellulose Plastics." T. L. Ralph. Plastics Institute, Southern Section. Polygon Hotel, Southampton.

Mar. 16.—"Adhesives." Speaker to be arranged. Plastics Institute, Yorkshire Section.

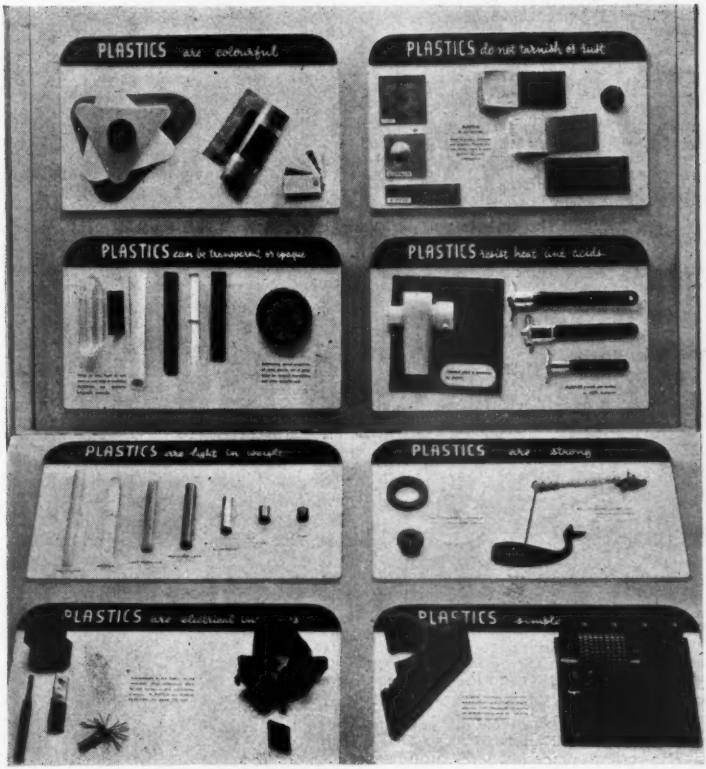
Mar. 17.—"Casein Plastics." J. H. Collins (Erinoid, Ltd.). Plastics Institute, North-Eastern Section. Neville Hall, Newcastle-on-Tyne.

Mar. 18.—Paper by J. B. Haughton (Electro-Heat Mouldings, Ltd.). Plastics Institute, North-Western Section. Engineers' Club, Albert Square, Manchester, 2.

Mar. 18.—"Fabrication of Laminates." Speaker to be arranged. Plastics Institute, Midlands Section. James Watt Memorial Institute, Birmingham.

Mar. 23.—"Vinyl Polymers." Dr. Skinner (British Geon, Ltd.). Plastics Institute, Western Section. Chemistry Theatre, The University, Bristol.

Mar. 24.—"Microscopy of Plastics, with Particular Reference to Phenolic Laminates." J. H. Wredden. Plastics Institute, London Section. Waldorf Hotel, Aldwych, W.C.2.


PLASTICS are colourful
PLASTICS do not tarnish or rust
PLASTICS can be transparent or opaque
PLASTICS resist heat and acids
PLASTICS are light in weight
PLASTICS are strong

BRITISH PLASTICS FEDERATION'S TRAVELLING EXHIBIT

FROM time to time the British Plastics Federation has received requests to provide an exhibit for educational purposes. In order to meet this demand, a portable exhibit has now been prepared under the direction of the Federation's Publicity Committee and is now available to approved organizations on request, subject to a small charge for carriage.

Supplementing our illustration, we give below the actual wording used:—

PLASTICS ARE COLOURFUL.

PLASTICS DO NOT TARNISH OR RUST.

PLASTICS CAN BE TRANSPARENT OR OPAQUE. Thick or thin, hard or soft, sheet or rod, tube or moulding, plastics are unusually adaptable materials. Astonishing optical properties of some plastics are of great value for surgical instruments and other scientific uses.

PLASTICS RESIST HEAT AND ACIDS. Chemical plant is protected by plastics. Plastics provide cool handles to hot saucepans.

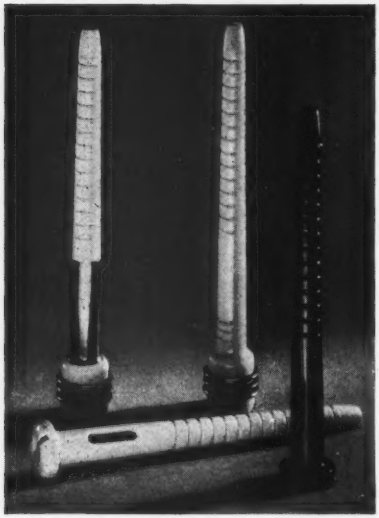
PLASTICS ARE LIGHT IN WEIGHT.

PLASTICS ARE STRONG. Powerful gears are machined from tough plastics. Nylon plastics are 10 times stronger than cotton.

PLASTICS ARE ELECTRICAL INSULATORS. Everywhere in the home, in switches, plugs, telephones, irons, in the factories and generating stations, plastics are making electricity safe to use.

PLASTICS SIMPLIFY PRODUCTION. Complex industrial components moulded from special high-strength plastics save thousands of hours of skilled manpower in reducing machine operations.

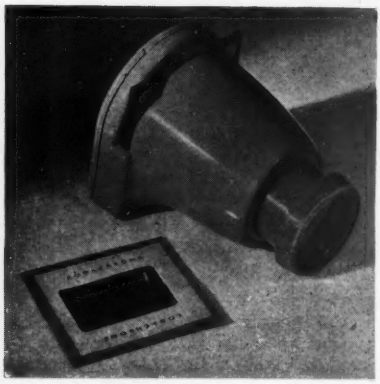
New Productions from the Moulding Shops



Moulded Plastic Pirns

The success that has attended the introduction to the textile industry of their flanged selvedge bobbins has now prompted Stabel Products, Ltd., of Burnsall Road, Coventry, to consider other places where moulded articles can be used to advantage. As an example, the production of plastic pirns has now passed the experimental stage. Sample lots, made in various types of moulding materials, have been given practical tests over a considerable period, and it has been possible to establish the best material to withstand the arduous conditions to which pirns, particularly in automatic looms, are subjected. When the quantities are fairly large, such pirns can be made at prices competitive with the ones made in wood.

Some of the advantages of these plastic pirns over the traditional types are as follows: There is perfect accuracy and uniformity. The plastic pirns are smooth when new, and will remain in this condition under constant use. Stability is retained under changes of atmospheric conditions. There is no metal ferrule to become loose or produce sharp edges. The plastic material offers a range of colours.



Colour Photo Viewer

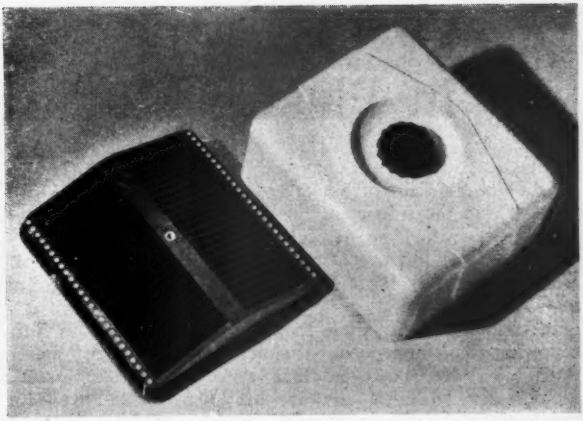
This viewer, as used for examining colour transparencies, incorporates two moulded components. The body is in light grey "Scarab" urea-formaldehyde; the bright red adjustable eyepiece is in "Beetle." Mouldings are by Brookes and Adams, Ltd., 250, Barr Street, Hockley, Birmingham, 19.

Conduit Fitting

Our photograph concerns an interesting association of three materials in a new conduit fitting by the General Electric Co., Ltd. The switch box and cover are zinc-base die castings, the switch body and locking ring for the cover are electrical-grade plastics.

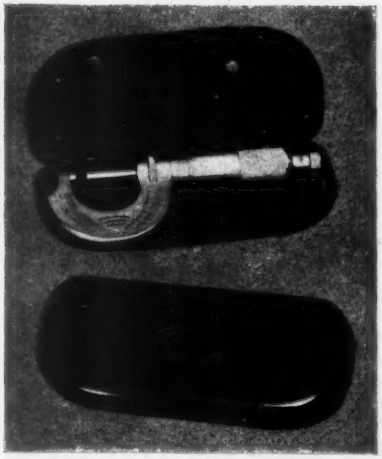
Lantern Slide Cabinet

The old type magic lantern, which used a slide measuring 3¼ ins. by 3¼ ins., is now being widely replaced by the modern still-view projector, taking slides 2 ins. by 2 ins., which are commonly made by mounting cuttings from 35 mm. film. The "Nebro" slide cabinet, here illustrated, provides handy dust-proof storage for these miniature slides. It has been specially designed by W. M. de Majo and P. Harvey, for Neville Brown and Co., Ltd., photographic distributors, London. Black phenolic is employed for moulding the base and screw knob; the cover is in either red or white urea. This excellently executed job was moulded by Rootes Mouldings, Ltd., Slough.



Micrometer Case

This pocket case for protecting a micrometer is of particular interest. The weight of the micrometer necessitates the use of three separate hinges to ensure a firm closure. To retain the heavy yet delicate instrument and its key in their positions, two rubber buffers are also fitted in moulded recesses in the lid.



The case, moulded from "Scarab" moulding powder, is formed on the inside to receive and position the micrometer and its key. The whole of the interior is sprayed with "Spraytex" to provide a protective felt-like coating, which assists in preventing movement, and avoids the rattling of the instrument within the case. Designed by I. E. White and moulded by Illingworths (Plastics), Ltd., Coxmore Road, Sutton-in-Ashfield, Notts, it is readily assembled, the special Illingworth snap-shut pinless hinges simply being pressed into moulded recesses in lid and base where they are held fast by spring lugs. The use of these hinges provides a firm closure, without the necessity for a front catch. Other features of practical interest are the rounded corners, enabling the case to be slipped into the pocket; the trade mark of the micrometer manufacturers, Moore and Wright, Ltd., Sheffield, is embossed on both outside and inside of the lid, and it is interesting to note that although sprayed with "Spraytex" the interior embossing is still clearly defined. The lid fits flush with the base all round, but a small lip is moulded on both lid and base to facilitate opening.

This micrometer case provides a very striking illustration of how the protective properties of an inexpensive moulded container can be utilized and enhanced by simple after-treatment and the addition of small components to comply with unusual specifications. The overall length of the case is 5⅜ ins.

Quality Control in Plastic Moulding—XVI

By W. M. HALLIDAY

REQUESTS have been conveyed to the author for a list of books and other literature on the subject of quality control, which would be helpful to those desiring to use the system but who lack knowledge of its basic principles and method of application.

In compliance with these requests, the following list is appended. It should be stated at once, however, that unfortunately the writer is unaware of any publications, books or booklets, which deal with the application of the system to plastic moulding processes. Most of the books about to be mentioned deal specifically with the use of quality control procedures to some purely machined form of production as mentioned earlier in this series. Incidentally, it is worth while noting that several large and reputable pressure die casting concerns, producing components in low melting point alloys, are successfully applying quality control inspection methods. In view of the similarity between pressure die casting and injection forms of plastic moulding it might also be reasonably expected that similarly successful results will be obtained.

"A FIRST GUIDE TO QUALITY CONTROL FOR ENGINEERS." This excellent introductory booklet, which has been repeatedly referred to throughout these articles, is published by the Ministry of Supply, Berkeley Court, Glentworth Street, London, N.W.1. It was first published in July, 1943, and is presumably still available. It has been expressly prepared to meet the needs of those engineers who possess no statistical knowledge at all of the basic principles of quality control. It describes those principles in very clear and non-technical language, giving the essential facts needed to enable the engineer to extract the basic information on which control charts are founded. The collection of data, the determination of control limits on charts, and the ways in which charts are to be interpreted are all clearly demonstrated. The various forms of quality control are described and a number of highly interesting practical examples are worked out in detail for the guidance of the readers. A number of extremely useful control charts taken from actual machine production jobs are appended to this booklet, which will be found of considerable assistance in guiding the reader. It really embraces in simple form a mass of valuable information concerning quality control which will be found of great help.

"AN ENGINEERS' MANUAL OF STATISTICAL METHODS," by L. E. Simon (Chapman and Hall, London, 1941). This is a first-class and exhaustive textbook upon the subject of statistical methods generally and their application to the control of engineering and manufacturing problems. The book is written in a manner relatively free from abstruse mathematical treatments in so far as the subject allows, and since the author is a well-known practitioner, indeed almost a pioneer in this field, it is well suited to meet the needs of the practical engineer. The value of the control charting methods as an easy and economical means of assuring quality is very extensively explained in a number of interesting chapters. In addition, the author contributes a number of special charts illustrating graphically how the quality or accuracy of a bulk production can be ascertained from data obtained from a small representative sample set taken from such a bulk. The book will be found of great value to those engineers

wishing to make a thorough study of this subject, since it is written by one who obviously possesses a profound understanding of the kind of problems confronting the engineer in his search for still closer control over the quality of manufactured articles.

"ECONOMIC CONTROL OF QUALITY OF MANUFACTURED PRODUCT," by W. A. Stewart (1931). This book is something in the nature of a classic in quality control literature and deals with the fundamentals. Unfortunately it is now somewhat old. None the less it is well worth reading, and when digested can be guaranteed to have afforded the reader a complete grounding in the basic principles of quality control. It is rather technical, however, and is not written from the standpoint of the engineer as in the case of the book just dealt with.

A number of small manuals or booklets are also obtainable. Most of these deal with only one or a few aspects of quality control methods or applications. They are none the less useful and interesting on this account, and all of them are well worth reading and digesting. The British Standards Institution has published several very valuable booklets of this kind, three of which are here mentioned.

"STATISTICAL METHODS IN RESEARCH AND PRODUCTION," edited by O. L. Davies. (Oliver and Boyd, Ltd., Edinburgh, 1947.) This is another extremely interesting and, indeed, valuable book on quality control fundamentals. Its special merit is that it is very up to date, and obviously the outcome of considerable original research into quality control methods and practice, mainly within the chemical industry. One of the main purposes pursued by the editor and contributors has been to provide a reliable handbook by means of which inspection staffs may acquire the essential theoretical knowledge necessary for the successful application of quality control inspection procedures.

The book is mainly written from the angle of the chemical engineer with a view to assisting him with his research and production problems. Nevertheless, it contains much useful information which will prove of guidance to the plastic production engineer desirous of gaining a better understanding or of making a more thorough study of the whole subject of quality control. The basic principles and statistical requirements of quality control inspection systems are very fully and completely explained. To a large extent the book is necessarily concerned with the basic technicalities, and thus contains considerable mathematical data. Generally, however, the exposition is clear and admirably comprehensive, and stress is continually given to the ability of applying those principles and methods to widely different problems of production. The earlier chapters will prove the most difficult to the unmathematically minded reader, as these deal with such subjects as frequency prevalences, distribution of frequencies of variations, the construction of frequency tables, and average measures and dispersions throughout whole batches of units. The later chapters, however, may be found the most helpful to the plastics engineer, as they deal with sampling, control chart constructions, and usage and interpretation.

An excellent glossary of quality control technical terms is another valuable feature. This will doubtless prove of considerable utility to those unfamiliar with quality control technicalities, by assisting towards clarifying some of the earlier statistical terminology employed. The book also contains a large number of fully worked-out practical examples of the application of quality control inspection. These are located at the end of most chapters, each example being arranged in an orderly fashion according to its degree of intricacy.

"QUALITY CONTROL" (British Standard 1,008 of 1942). This is an admirable and succinct little guide to the whole subject. It is based upon American practice. As an explanation of quality control terms, methods and principals, it will prove exceedingly useful to the engineer having no previous knowledge. Studied

in conjunction with the more extensive books already mentioned, it will materially assist in guiding him through the "mysteries" of the subject.

"CHARTS FOR QUALITY CONTROL. FRACTION DEFECTIVE" (British Standard 1,313 of 1947). This booklet is a valuable introductory, especially to the subject of control by fraction defective. It describes very fully how charts for this form of inspection are to be prepared, used and interpreted. Their application to a variety of different manufacturing conditions is also illustrated. One very valuable feature of this booklet is the number of important specimen control charts, which will serve to guide the non-technical reader perhaps better than lengthy involved explanations. Another very useful feature likely to appeal to the engineer wishing to install quality control, without previous knowledge of the subject, is the exhaustive instruction sheet appended to each control chart. This sheet indicates in a concise manner each step to be taken, first to prepare the chart, and later, when it is applied to the production job. Several practical examples are considered.

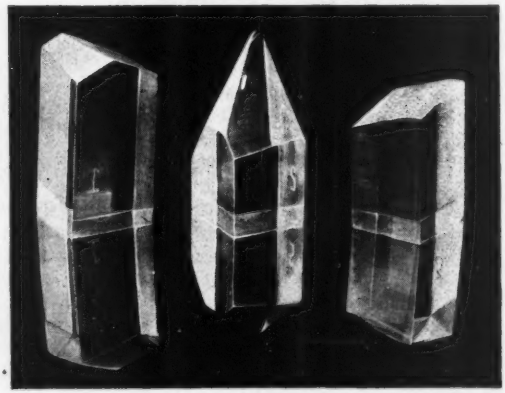
"QUALITY CONTROL CHARTS," by B. P. Dudding and W. J. Jennett (British Standard 600R). This useful little booklet, written by two authors who have done a considerable amount of research into quality control problems, deals chiefly with the principles and methods of control chart construction. It deals with charting for a great variety of purposes, and indicates the manner in which data has to be ascertained prior to the construction of such charts. It is written from the engineer's angle and will well repay study.

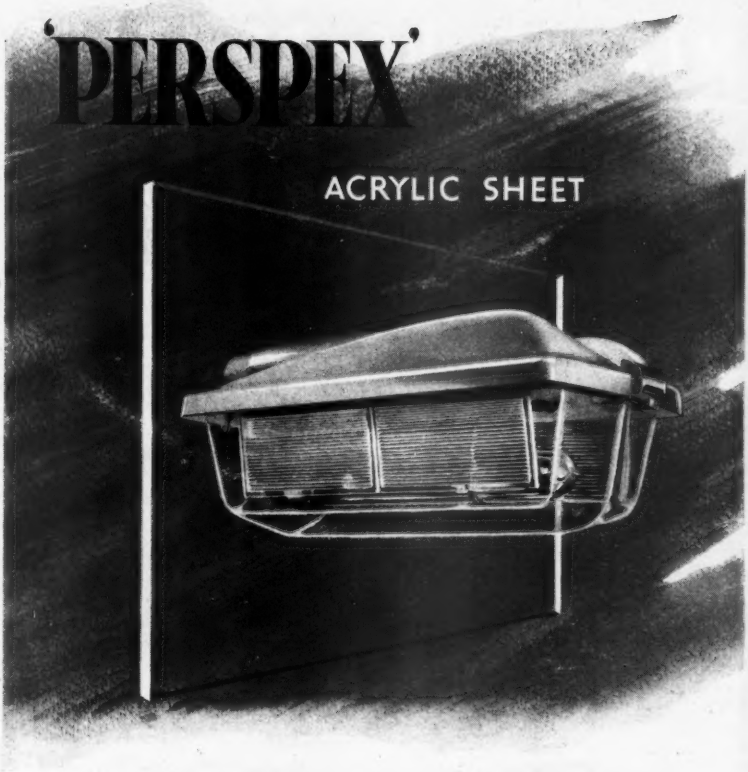
"APPLICATIONS OF QUALITY CONTROL" (Ministry of Supply). A series of very informative and simply written leaflets have been published by the Ministry of Supply. Each is profusely illustrated and deals with a particular application of quality control. The first leaflet explains the evaluation of standard control limits and their location upon control charts; the second deals with quality control on hand-operated machines; the third illustrates the application of group-type control charts on a battery of automatic multi-spindle automatics. The bulk of the information contained in this excellent series has been obtained directly from industrial works where the various schemes have been successfully employed.

Finally, a number of excellent technical articles have been published in the engineering Press in this country over the past 10 years, but these are too numerous to enumerate here.

Plastic Replicas of Diamond Tools

Our illustration shows Plexiglass models of three diamond tools which are used in the forming of jewel settings of brass. The use of models of such tools has proved to be extremely helpful, as the actual tool is extremely small and the various parts of such a cutting edge can only be seen under the magnifying glass. These models have further been used to inform the diamond polisher about the structure of the diamond. Tools which have proved well in practice were investigated by X-ray diffraction. (Courtesy, Hamilton Watch Co.)





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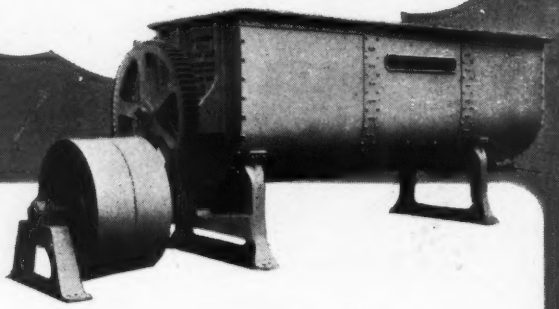

Shown here is a GARDNER Patent "Rapid" Mixer, for the efficient mixing of large batches of powders in varying proportions. This is just one of many machines designed for effective processing of powders in large or small batches.

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The Microscopic Examination of Plastic Materials

VII.—Mouldings (Contd.)

By J. H. WREDDEN, F.R.M.S.
(Chief Chemist, Igranic Electric Co., Ltd.)

IN continuing our examination of the moulding produced from the mixed powder, the evidence to date points to the fact that when a moulding powder is compounded from two others, the one pigmented and the other not, presumably with the object of producing a uniform colour tone in the final product, then the resultant structure is not as homogeneous as might be expected. It was shown that the granules of the pigmented fraction of the powder retained their individuality to a surprisingly high degree, so much so that they could be regarded as individual mouldings produced in a matrix of the unpigmented fraction.

This was seen to result in the production of structures which might be expected to occur from the flow phenomena existing in the secondary particles. These latter proved to be similar to those that occur in a moulding made from a one-part powder, although somewhat modified by the presence of the second fraction, which could be regarded as functioning as a matrix. Thus, the entire moulding currently under consideration may be broadly looked upon as being composed of a large number of small mouldings, formed by the secondary particles in a matrix of the unpigmented fraction of the powder. The final form of these " mouldings " is largely dictated by the flow characteristics of the surrounding matrix, which, in turn, are influenced by the common wood flour filler and the plasticity of the secondary particles themselves.

In dealing with the high degree of retention of individuality exhibited by the secondary particles, it was pointed out that there appeared to be little, if any, fusing of the pigmented and unpigmented material, as evidenced by the sharply defined borders seen in the secondary particles. It is clear, on the other hand, that even if the borders are clear cut, there must be some bonding on the surfaces of the two materials at these places. If otherwise, the strength of the final moulding would suffer considerably, although as against this it should be borne in mind that if the secondary particles be regarded as a coarse filler, then their extremely irregular shape might conceivably compensate for a degradation of the strength due to poor bonding at the interfaces of the two fractions.

In practice, however, it is more than probable that there is a certain degree of fusion of the resin, which is a common constituent of both fractions. Therefore

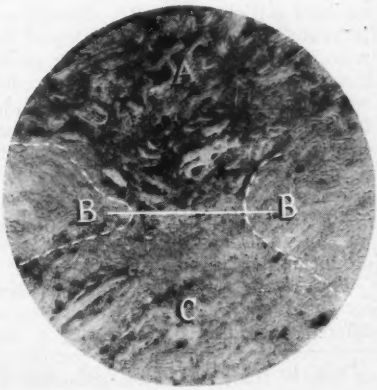

Fig. 369.—Section of wood flour filled moulding. Mag. 91 diameters.

it is expedient to study the structure of this moulding at somewhat closer quarters, although before proceeding with this it is proposed to examine the boundary of another secondary particle where a certain amount of fusion has occurred. This is illustrated in Fig. 369, where the secondary particle A is seen to possess a clear-cut boundary on the left, extending for some distance downwards, and near the bottom of the particle the sharply defined nature of the boundary no longer exists, but becomes very indefinite. The right-hand side of the particle is also seen to be somewhat indefinitely defined, although one could state that a more or less sharp boundary exists.

The greatest interest in this instance, however, is centred at the bottom of the particle, BB, where a clear case of blocking by the wood particles above the line has occurred, as evidenced by the ordinary density of the pigment at this place compared with the scattered agglomerates met with below the line. This is probably the result of fusion taking place at this point, resulting in a free intermingling of the resin, but not the pigment.

Thus, the small amount of pigment outside the particle would be carried there by the initial outward flow of resin, but this would be stopped by the piling-up of wood particles above BB, although not preventing the mixing and fusing of the resin, which would continue to the extent shown by the area C. This configuration would appear to be brought about by the formation of the matrix masses on either side of the "throat" at BB, presumably resulting in an area of relatively low pressure below the point into which some of the material of the secondary particle would tend to flow and intermingle, thus producing the "fusion area" at C.

Thus there exists the possibility of encountering areas of at least three different densities of pigment, if the unpigmented portions may be considered as one of these, and it is proposed to study typical examples of these areas at increasing magnifications.

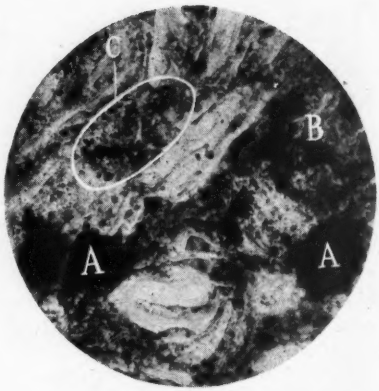

Fig. 370.—Wood flour filled moulding, showing highly pigmented area. Mag. 370 diameters.

An example of a heavily pigmented area is seen in Fig. 370, at a magnification of 370 diameters. This illustration gives a very good idea of the pigment distribution. It shows a portion of the section containing representative agglomerates of pigment, which will be seen to vary in size from the large ones marked A, to the individual granules forming the general background of pigment, through intermediate sizes such as those in the groups marked B and C towards the top of the illustration.

The range of sizes for these agglomerates of pigment particles, however, is large and results in a graduation which makes it difficult to determine where individual particles cease to exist and agglomeration begins. If the smallest visible agglomerates, as at C, are taken as a guide, then it will be seen that the general distribution of single-pigment particles is fairly even, and the only interruption is due to the presence of the masses of cellulose in the form of particles of wood flour, which are seen to be quite large, even in relation to the size of the large agglomerates. In view of this, it becomes clear that the wood particles have a considerable influence on the even dispersion of the pigment, as the latter cannot, of course, affect the cellu-

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THE FLEXURAL STRENGTH OF MONSANTO Lustron

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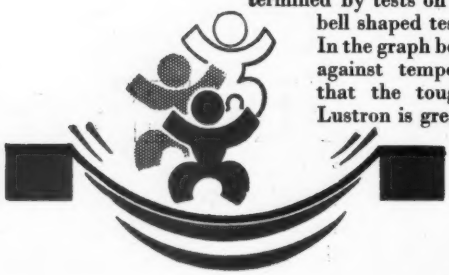
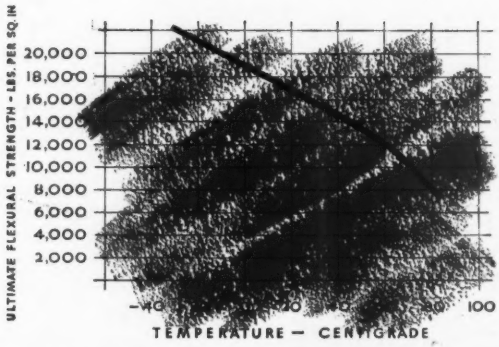
Flexural strength at various temperatures was determined by tests on a two inch length of a dumb-bell shaped test piece of $\frac{1}{4}$" x $\frac{1}{4}$" cross section. In the graph below flexural strength is plotted against temperature and the curve shows that the toughness of injection moulded Lustron is greater at lower temperatures.





Ultimate Flexural Strength versus Temperature of Lustron

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lose. Therefore the siting of the pigment in any particular portion of the material is largely dependant, in the first instance, on the original orientation of the wood, and subsequently on the re-orientation of this latter occurring during flow.

The reason for the agglomeration is not at present clear; it might be due to either of two chief characteristics, resulting in the phenomenon occurring at different stages of the process. Thus the pigment might possess a tendency to "ball up" in its normal condition, in which case it would not be a free flowing powder; however, this can be circumvented by taking the necessary steps to keep it dry, as, generally speaking, the presence of moisture is the chief cause, particularly in materials such as iron oxide, which was used in the example under consideration.

Assuming that the pigment is blameless, the next possible cause of agglomeration occurs during the initial mixing on the rolls. If the conditions existing at the time the pigment is introduced into the plastic mass of resin and filler, etc., be examined, it will be appreciated that a considerable quantity of water is being evolved, due to the resin reaction. This is mainly present throughout the structure of the mass, which is being subjected to a considerable degree of disturbance, thus producing a condition where the greatest volume of material is brought into intimate contact with the pigment in the shortest space of time

It is not surprising that agglomeration should occur at this stage, but whether or not the subsequent rolling is sufficient to break down these masses, is yet to be elucidated. It is, however, very probable that the phenomenon occurs at this stage, if not already present in the raw pigment, because the possibility of it occurring during the moulding process is somewhat remote. This will be appreciated when it is realized that the basic cause of agglomeration in this manner is mainly due to high interfacial tension between pigment grains and water, as shown by the great difference in the ease with which the dry powder may be dispersed on the one hand in water, and on the other hand in, say, alcohol. Indeed, it is much more difficult to disperse or "wet" the pigment in water, and in view of the known high surface tension or poor wetting properties of phenolic resins, the logical assumption is that agglomeration occurs at the stage indicated.

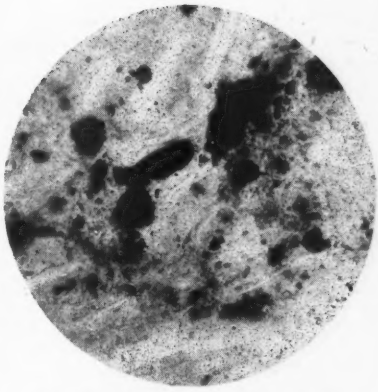

Fig. 371.—Wood flour filled phenolic moulding, showing agglomerates. Mag. 370 diameters.

Once the pigment is thoroughly wetted with the resin, it is difficult to see how agglomeration can occur at a later stage, that is, in the mould, unless a different basic cause exists, which would appear to be possible on the grounds of the existence of differing charges in the molecular structure of the constituents in the mixture. This latter, however, is less likely to be the chief cause of the existence of these masses of pigment than that formerly discussed.

Lacking evidence to the contrary, therefore, we can only assume that the basic reason for the presence of these agglomerates lies in the initial stages of the processing of the powder. The point of chief interest lies in the structure of these masses. As the reason for their formation exists in the high interfacial tension which prevents the wetting of each particle of pigment, it will be appreciated that each agglomerated mass consists of a core of dry pigment bounded

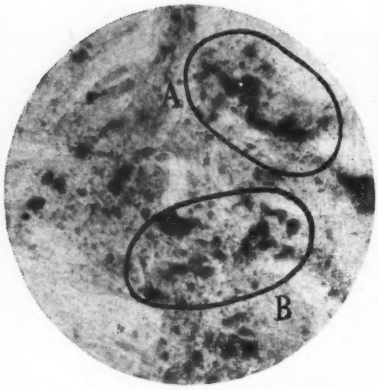

Fig. 372.—Wood flour filled moulding, showing breakdown of agglomerates. Mag. 370 diameters.

on the outer surface by a relatively thin layer of resin wetted particles, thus producing a mass which is comparable in size to a small filler particle, although possessing much inferior inherent strength when compared to this latter.

When a collection of agglomerates occurs, such as that seen in Fig. 371, the obvious inference is that the stress distribution at this point in the structure of the moulding, is adversely affected, particularly so when, assuming they are developed as a result of precipitation in the mould, they must still possess their original structure of a dry core to a very large extent, in spite of the moulding pressure.

That this is so can be deduced from the fact that if the agglomerates were impregnated by the fluid resin under the influence of the moulding pressure, then each particle of pigment would be wetted and the dispersion completed. This does not mean to say that no breakdown occurs, for it is highly probable that some of the larger units are partially broken down. The pigment pattern seen in the illustration under discussion suggests such an occurance, where a very large agglomerate appears to have been subjected to incomplete impregnation, resulting in a breakdown of the main structure and partial dispersion of the pigment.

Nevertheless the masses remaining as agglomerates are large enough to have an adverse effect on the stress distribution in the structure of the moulding at this point, and it is suggested that structures such as these are indicative of the presence of agglomerates in the powder which are too large. Indeed, one is inclined to go so far as to say that those present in the moulding could be very much smaller, as it will be seen that as they are of similar size to the normal filler particles in the smaller fractions. Further, as they possess little strengthening qualities, if any, these agglomerates of pigment may be regarded as being truly extraneous, and serve no great utility except that of imparting colour.

As distinct from the breakdown of large agglomerates such as those just discussed, wherein the size of the final masses is still fairly large, other examples are to be found where the breakdown is seen to have proceeded much further. Fig. 372 shows this type of breakdown, from which it will be seen that in the areas A and B the dispersion of small agglomerates appears, in each case, to have originated from a larger one. Even here relatively large units are still present, particularly in the area marked A, where the large residual agglomerate is surrounded by much smaller individuals. In area B, however, the largest unit is considerably smaller than that in area A.

The configurations represented in this illustration give rise to some interesting speculations regarding the possible mechanism which comes into operation to bring this about. Thus the presence of the comparatively large agglomerates which are left would tend to suggest that, initially, the moulding conditions resulted in the onset of penetration of the resin into the structure of the agglomerate, thus causing progressive disintegration of this body as the resin penetrated its structure. This would continue as long as the resin was in a mobile condition; therefore it would appear that penetration cannot

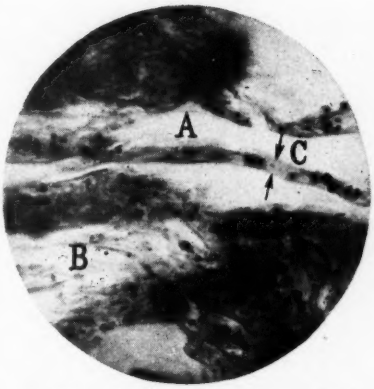

Fig. 373.—Wood flour filled moulding, showing penetration of pigment. Mag. 1,040 diameters.

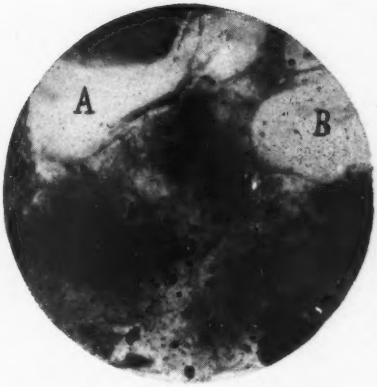

Fig. 374.—Wood flour filled moulding, showing wood vessels in pigmented material. Mag. 1,040 diameters.

proceed to finality, due to the setting of this latter.

From this hypothesis it can be inferred that an improvement in pigmentation, and possibly the physical and electrical characteristics of the finished moulding, may be achieved by ensuring that agglomerates do not occur in the first instance; or if this is not possible, that the initial size of these masses be kept as small as possible, with a view to increasing the probability of their thorough breakdown and dispersal in the mould. If the disintegration can be assured, then the dispersal will follow automatically as a result of the turbulent flow which occurs, and which has already been demonstrated to exist.

Further to this, it will also be clear that with faster curing resins the prevention of pigment agglomeration is still more necessary, added to which is the effect of the pigment in increasing the effective viscosity of the powder containing it, which may be expected to be greater where much agglomeration is present.

In view of this, it might be as well to endeavour to develop an ideal concept of what is required in the way of pigment. This is fairly clearly defined at the outset, as it is apparent that the primary object of incorporation of the pigment is to impart an even colour to the finished moulding, and it is obvious that this can only be achieved if each pigment particle is present in the ultimate structure as an individual entity. All such particles must then be evenly distributed throughout the resin matrix, which signifies the same concentration of pigment particles wherever the resin is present.

However, it is immediately apparent that this ideal is incapable of being completely realized, as the moulding consists of filler particles (which are more usually in the greater proportion) and resin. Assuming that the resin in the first place acts as an ideal vehicle for the pigment, the concentration of this latter will clearly be upset by the filler particles, for in many cases the resin will penetrate and fill wood vessels and tracheids, but the pigment will be filtered out due to the size of the particles. Nevertheless, in spite of this there will also be very many cases where the interstices of the wood structure will admit the pigment particles, thus tending to keep the concentration constant.

The fact that it is possible for pigment particles to actually enter the lumen of the wood vessels is shown in Fig. 373, illustrating two wood vessels at a magnification of 1,040 diameters. Here the

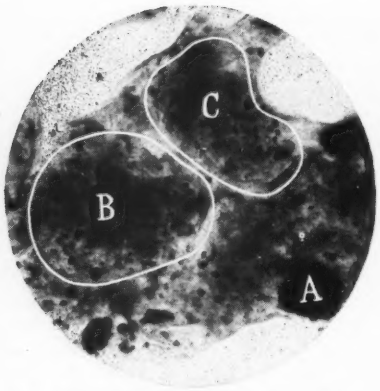

Fig. 375.—Wood flour filled moulding (as seen in Fig. 374) photographed at lower focal plane. Mag. 1,040 diameters.

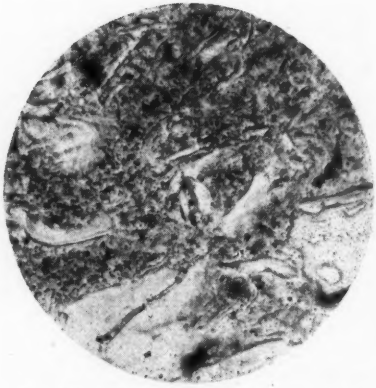

Fig. 376.—Wood flour filled moulding: unpigmented portion. Mag. 300 diameters.

Fig. 377.—Wood flour filled moulding: unpigmented portion. Mag. 1,040 diameters.

vessels marked A and B are clearly seen to possess fairly small lumens, but despite this the presence of pigment granules inside the bore in each case is unmistakable. These latter are individual granules whose size is fairly consistent, and the manner in which they are carried into quite small spaces by the resin is well illustrated. It is also interesting to note that at C the diameter of the lumen in vessel A is approximately 2μ, from which it follows that the pigment granules at this point are between 1μ and 5μ in diameter. Thus it is clear that for efficient pigmentation of the moulding, agglomerates should not exist at all, as the largest permissible size is comparable to the granule size of the pigment.

The illustration under discussion also indicates how the presence of the cellulose masses of the cell walls of the wood disturb pigmentation. This is further illustrated by Fig. 374, showing a different portion of the section at 1,040 diameters, where two wood vessels, A and B, are seen in a mass of pigmented material containing a high concentration of pigment. Here it is seen that the proportion of the total area of the field occupied by the cellulose is by no means inconsiderable, and when it is appreciated that this area has a zero concentration of pigment, whereas the concentration in the surrounding mass is high, the effect of the cellulose on the average concentration needs no emphasis.

It will also be noticed that at this magnification the graduation in size of agglomerated pigment masses becomes more apparent; further, as the thickness of the section also becomes more apparent, it is possible to determine changes in density in layers through the section, as shown in Fig. 375, which illustrates the same section at the same

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magnification, with the focal plane at a somewhat lower level than in the previous illustration. The large agglomerate A will be recognized from the previous illustration. It will also be seen that the areas B and C are more densely pigmented than at the level seen in Fig. 374, although in this latter the denser pigmentation is indicated by the indistinct darker masses.

The question of the condition of the pigment in a moulding of this nature appears to be of some importance. In view of the possibility of undesirable qualities existing in the finished article, when the pigment consists of a large number of agglomerates (as in the example under discussion) and in view of the presence of a dry core to each agglomerate, it is suggested that further work on this question is indicated. For instance, it would seem desirable to investigate the ultimate effect of this condition on mechanical and electrical characteristics.

Apart from this, it is generally accepted that pigmentation in any substance should consist of a theoretically perfect distribution of pigment granules. Wherever this is required, and in the material under consideration, it is obviously impossible to achieve this ideal, due to the presence of the wood flour; nevertheless, the pigmentation itself in those portions of the structure which carry it could be much more evenly distributed if agglomeration were absent.

One curious feature arising from the examination of the secondary particles is the almost entire absence of the minute bubbles encountered in other unpigmented mouldings. The reason for this cannot be explained with any certainty, but it is highly probable that the pigment agglomerates play a large part in their suppression, because when the unpigmented portions of the section are examined the bubbles are seen to exist.

An example of this is seen in Fig. 376 at a magnification of 300 diameters. In this illustration the resin masses can be seen to contain numerous bubbles of small size which are very similar to those met with in previous materials.

A portion of unpigmented material in the neighbourhood of a secondary particle is seen in Fig. 377 at a magnification of 1,040 diameters. This clearly shows the numerous bubbles in the resin, both outside and filling the lumen of the large vessel A; also seen are a few isolated pigment granules and agglomerates, such as those at B and C, but the presence of the latter is due to the close proximity of the secondary particle, which is not seen in the field. From this it will be appreciated that, as the large numbers appear in the unpigmented portions and not in the pigmented portions, the presence of pigment must be a major factor influencing their suppression, as all the other constituents are presumably the same.

(To be continued.)

SUSPENDED LIGHTING FITMENTS

(Continued from page 141.)

using "Perspex" as a substitute for crystal glass. In general appearance, the "acrylic" fittings compare very favourably with glass, although the construction is essentially different. One of the advantages of the "acrylic" material lays in being able to replace quite easily any part of the whole assembly which becomes broken as the result of an accident; in the case of glass it is not only expensive, but difficult to replace a broken lustre.

Our other illustrations are of more conventional types of lighting pendant and bracket made in "acrylic" strips, ½ in. thick, which are highly polished and have all edges smoothed. The candle tubes are of polished aluminium to give the appearance of silver, and are lacquered to preserve their finish.

For the wiring of these fittings, a specially cut groove is provided to house the plastic-insulated wire, which is readily replaced when necessary and is barely perceptible.

PATENT REVIEW

The following abstracts have been made from specifications at the Patent Office, with the permission of the Controller of H.M. Stationery Office. Complete specifications can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2. price 1/- each.

B.P. 608,835. Appl. 15.3.46. Conv. (U.S.A.) 21.5.45. Acc. 21.9.48.

Polystyrene Compositions and Methods of Making the Same. To: Standard Telephones and Cables, Ltd.

Plasticization of polystyrene with a dimer of 1, 2-dihydronaphthalene. Such a composition is no longer brittle or shock sensitive and may be used for extrusion, moulding, casting, etc. The good electrical properties of polystyrene are maintained.

B.P. 608,893. Appl. 21.2.46. Conv. (Netherlands) 2.5.45. Acc. 22.9.48.

Process for Pasting Halogen-containing Polymerization Products on Surfaces. To: N. V. De Bataafsche Petroleum Maatschappij.

Pasting of vinyl chloride polymers to other surfaces employing a solution of a vinyl chloride-vinylidene chloride copolymer as adhesive.

B.P. 608,921. Appl. 4.3.46. Conv. (Netherlands) 23.3.44. Acc. 22.9.48.

Polymerizing together a Plurality of Polymerizable Substances in the Emulsified State. To: N. V. De Bataafsche Petroleum Maatschappij.

B.P. 608,940. Appl. 13.12.44. Conv. (U.S.A.) 30.11.43. Acc. 23.9.48.

Resin Products and Preparations thereof. To: The Borden Co.

Water soluble phenol-formaldehyde condensation product made by reaching 1 mol of phenol with 1.5-2 mols of formaldehyde until the reaction product contains less than 0.75 per cent. of free formaldehyde. The reaction product so obtained is subsequently reacted with resorcinol.

B.P. 608,947. Appl. 11.4.45. Conv. (U.S.A.) 1.4.44. Acc. 23.9.48.

Plasticized Compositions and Process for Preparing the Same. F. J. Groten and R. J. Reid. To: The Firestone Tire and Rubber Co.

Refers to a plasticized composition of butadiene-acrylonitrile and a phenol formaldehyde resin.

B.P. 608,955. Appl. 17.7.45. Conv. (U.S.A.) 3.10.44. Acc. 23.9.48.

Polymerization of Organo Siloxanes. E. L. Warrick. To: Corning Glass Works.

B.P. 608,956. Appl. 17.7.45. Conv. (U.S.A.) 3.10.44. Acc. 23.9.48.

Organo silicon Compositions and Methods of Making them. To: Corning Glass Works.

B.P. 609,138. Appl. 6.3.46. Conv. (U.S.A.) 6.3.45. Acc. 27.9.48.

Synthetic Linear Polymers. To: E. I. Du Pont de Nemours and Co.

B.P. 609,156. Appl. 7.3.46. Conv. (U.S.A.) 19.11.45. Acc. 27.9.48.

Alpha, Beta-dihaloacrylates and Polymers. To: Wingfoot Corporation.

B.P. 609,172. Appl. 8.3.46. Conv. (U.S.A.) 15.3.45. Acc. 27.9.48.

Preparation of Alkylhalogenosilanes. To: British Thomson-Houston Co., Ltd.

B.P. 609,177. Appl. 8.3.46. Conv. (U.S.A.) 17.3.45. Acc. 27.9.48.

Polyethylene-oxidation Inhibitor. To: Bakelite Corporation.

Heat and light stabilization of polythene by incorporating polymerized ethylene diphenylamine (less than 1 per cent.).

B.P. 609,223. Appl. 13.11.45. Acc. 28.9.48.

Containers for Powder or other Finely Divided Materials. A. G. Rose. To: Rose Brothers (Gainsborough), Ltd.

B.P. 609,225. Appl. 20.11.45. Conv. (U.S.A.) 31.4.45. Acc. 28.9.48.

Vinyl Halides and Method of Preparing Same. W. B. Morgan. To: B. F. Goodrich Co.

Refers to a manufacturing method which greatly increases the effective life of the catalyst employed (mercuric chloride).

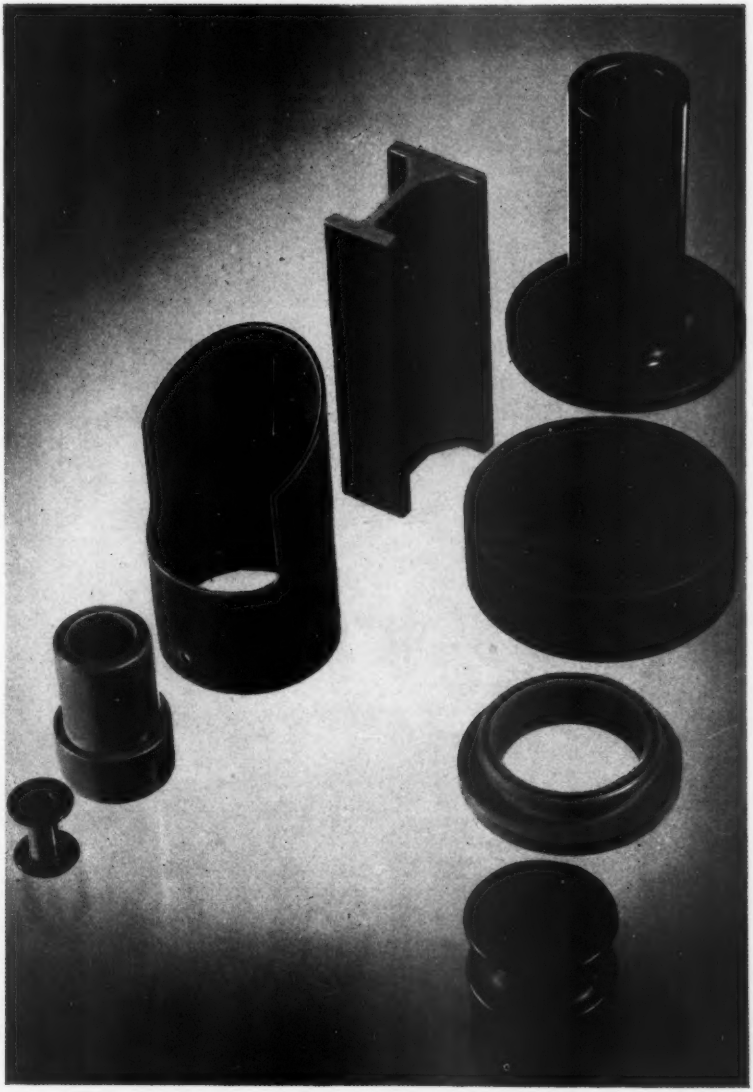
B.P. 609,251. Appl. 8.3.46. Conv. (U.S.A.) 13.3.45. Acc. 28.9.48.

Manufacture of Shaped Articles of Regenerated Cellulose Produced from Viscose. To: British Cellophane, Ltd.

B.P. 609,257. Appl. 9.3.46. Acc. 28.9.48.

Delustring of Nylon. R. P. Foulds and W. H. Rosco. To: Tootal, Broadhurst, Lee Co., Ltd.

Delustring of nylon by bringing it into contact with a solution of antimony trichloride in aqueous hydrochloric acid, subsequently adding an aqueous liquor to precipitate antimony oxide on the nylon, followed by neutralization of any free hydrochloric acid.



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Plasticized Vinyl Resin Compositions. T. L. Gresham. To: B. F. Goodrich Co.
Vinyl chloride composition plasticized with chlorophthalates.

B.P. 609,289. Appl. 11.3.46. Conv. (U.S.A.) 2.5.45. Acc. 28.9.48.
Polymers and Copolymers of Chloroethylenes and Process of Producing the Same. C. H. Alexander. To: B. F. Goodrich Co.

B.P. 609,287. Appl. 11.3.46. Acc. 28.9.48.
An Improved Vulcanizable Composition. To: Standard Oil Development Co.
Refers to a low temperature isobutylene-diolefin copolymer containing a dialkyl ester of a dibasic acid or a triethyl ester of a tribasic acid.

B.P. 609,291. Appl. 11.3.46, 22.10.46. Acc. 28.9.48.
Manufacture of Polyvinyl Chloride Pastes. R. G. Humphreys. To: The Greenwich Leathercloth Co., Ltd.
Polyvinyl chloride paste containing less than 5 per cent. of polystyrene, naphtha and a plasticizer (tricresyl phosphate or a phthalate).

B.P. 609,310. Appl. 11.5.45. Conv. (U.S.A.) 17.6.44. Acc. 29.9.48.
Dielectric Heating of Plastic Materials. H. R. Saslaw. To: Standard Telephones and Cables, Ltd.
Refers to high-frequency heating of plastic materials undergoing extrusion or injection moulding.

B.P. 609,315. Appl. 24.9.45. Acc. 29.9.48.
Phenolic Synthetic Resinous Glue Compositions. L. N. Phillips and M. G. M. Pryor.
Refers to a phenolic resin glue containing furfuraldehyde.

B.P. 609,324. Appl. 29.11.45. Acc. 29.9.48.
Process for Making Silicon Polymers from Organo-substituted Silicones. A. H. Campbell. To: Revertax, Ltd.

B.P. 609,351. Appl. 12.3.46. Acc. 29.9.48.
Improvements in a Mould for Moulding an Extensible Article, for example, a Bracelet formed of Plastic Material. N. Barbieri.

B.P. 609,482. Appl. 27.11.44. Conv. (U.S.A.) 2.12.43. Acc. 1.10.48.
Manufacture of 2 : 5 Dichlorostyrene and Polymerization Products therefrom. To: Monsanto Chemicals Co.

B.P. 609,507. Appl. 10.1.46. Conv. (U.S.A.) 15.1.45. Acc. 1.10.48.
Production of Alkyl Silicon Halides. To: Dow Chemical Co.

B.P. 609,526. Appl. 11.3.46. Acc. 1.10.48
Method and Apparatus for Forming the Seams in Fluid Containers. A. E. Simpson and P. J. Schofield. To: Imperial Chemical Industries, Ltd.

B.P. 609,544. Appl. 15.3.46. Acc. 4.10.48.
Production of Useful and Decorative Articles and Materials. W. E. F. Gates, To: Imperial Chemical Industries, Ltd.
Process for the production of decorative articles whereby a fluid plastic composition (preferably consisting of a vinyl chloride polymer or copolymer and a plasticizer) is extruded through a die or stencil on to a non-uniform surface, subjecting the surface so treated to the action of heat in order to get the vinyl chloride paste.

B.P. 609,545. Appl. 15.3.46. Acc. 4.10.48.
Forming Transparent or Translucent Windows in Sheet Material. W. E. F. Gates. To: Imperial Chemical Industries, Ltd.
Method of attaching polythene film windows to cardboard boxes.

B.P. 609,560. Appl. 15.3.46. Acc. 4.10.48.
Comminution of Polythene. E. Mehl and L. H. Bellamy. To: F. W. Berk, Ltd.
Comminution of polythene by spraying molten polythene under pressure through a nozzle simultaneously contacting the spray with a stream of air, gas, steam or water to deposit the comminuted particles.

B.P. 609,586. Appl. 18.3.46. Conv. (U.S.A.). 19.3.45. Acc. 4.10.48.
Solutions of Copolymer. To: E. I. Du Pont de Nemours and Co.
Process for making a solution of copolymer of tetra-fluoroethylene and ethylene by heating the copolymer with diisobutyl adipate (or dialkyl esters of a saturated acyclic hydrocarbon dicarboxylic acid) at a temperature below the boiling point of the ester.

B.P. 609,598. Appl. 28.3.46. Conv. (U.S.A.) 26.4.45. Acc. 4.10.48.
Apparatus for Free Blowing Thermoplastic Sheet Material. To: Goodyear Aircraft Co.
Refers to jigs and methods for free blowing of flat methyl methacrylate sheets into bubbles for airplane canopies and the like.

B.P. 605,277. Appl. 18.10.45. Conv. (Belgium) 6.1.43. Acc. 20.7.48.
Producing Vinyl Chloride. To: Solvay and Co.

Manufacture of vinyl chloride by thermal decomposition of 1,2-dichlorethane.

B.P. 605,573. Appl. 30.7.45. Conv. (U.S.A.) 10.10.44. Acc. 27.7.48.

Plasticized Organic Compositions. D. E. Adelson and H. Dannenberg. To: Shell Development Co.

Plasticized composition comprising an organic plastic or elastic material (cellulose nitrate) and polyallyl acetate as plasticizer.

B.P. 605,579. Appl. 4.10.45. Conv. (France) 24.8.42. Acc. 27.7.48.

Dry-Spinning of Solutions of Polymerized Vinyl Compounds. To: Société Rhodiaceta.

B.P. 605,584. Appl. 16.11.45. Conv. (France) 24.8.42. Acc. 27.7.48.

Dry-Spinning Solutions of Cellulosic Derivatives in a Closed Circuit. To: Société Rhodiaceta.

B.P. 605,863. Appl. 17.4.44. Acc. 3.8.48.

Manufacture of Thermoplastic Compositions. J. J. Staudinger, B. K. Kelly and A. Cooper. To: Distillers Co., Ltd., and Expanded Rubber Co., Ltd.

Refers to improvements in the manufacture of expanded thermoplastic compositions. The process comprises immersion of the thermoplastic material in the form of discrete particles in a volatile non-solvent liquid, removing excess liquid, shaping the wetted particles in a mould to produce a blank, subjecting the blank to heat treatment to effect sintering of the particles, cooling the blank, removing it from the mould and subject it afterwards to heat treatment to effect expansion.

B.P. 605,866. Appl. 15.11.44. Acc. 3.8.48.

Sizing with Synthetic Resin Compositions. F. Kiviat.

B.P. 606,256. Appl. 29.9.42. Conv. (U.S.A.) 11.10.41. Acc. 11.8.48.

Secondary Closures for Bottles and like Containers. To: Viscose Development Co., Ltd.

Shrinkable non-fibrous cellulosic closure for bottles.

B.P. 606,259. Appl. 8.2.45. Acc. 11.8.48.

Injection Moulding of Resinous Compositions. D. N. Davies. To: British Resin Products, Ltd.

B.P. 606,273. Appl. 19.9.45. Conv. (U.S.A.) 19.9.44. Acc. 11.8.48.

Production of Polymers and Copolymers comprising Trifluoroethylene. To: E.I. Du Pont de Nemours and Co.

B.P. 606,610. Appl. 16.1.46. Conv. (U.S.A.) 16.1.45. Acc. 17.8.48.

Production of Cellulose Derivatives. To: British Celanese, Ltd.

B.P. 606,717. Appl. 2.1.46-1.2.46. Acc. 19.8.48.

New Polymerizable Materials and Polymers thereof. R. Hammond and D. N. Speyer.

B.P. 607,103. Appl. 25.1.46. Acc. 25.8.48.

Production of Organic Fluorine Compounds. G. W. Rigby. To: E.I. Du Pont de Nemours and Co

Refers to the production of 2.4.6.-tri-(fluoromethyl)-s-triazines.

B.P. 607,111. Appl. 25.1.46. Conv. (U.S.A.) 6.12.44. Acc. 25.8.48.

Accelerators for the Culvanisation of Natural and Synthetic Rubber. M. W. Harman. To: Monsanto Chemical Co.

Refers to the use of accelerators derived from mercaptobenzothiazole.

B.P. 607,253. Appl. 29.1.46. Conv. (U.S.A.) 14.2.45. Acc. 27.8.48.

Methyl Siloxanes and Methods of preparing them. E. L. Warrick. To: Corning Glass Works.

B.P. 609,609. Appl. 18.3.46. Conv. (U.S.A.) 26.2.42. Acc. 5.10.48.

Organo-Siloxanes and Methods of preparing them. To: Corning Glass Works.

B.P. 609,648. Appl. 19.3.46. Conv. (U.S.A.) 17.7.45. Acc. 5.10.48.

Improved Resins and Compositions containing the same. C. Parker, Jr. To: American Cyanamid Co.

Preparation of synthetic resins by reacting fumaric acid conjugated acyclic diene adducts with at least one polyhydric organic compound. Examples of conjugated cyclic dienes quoted: butadiene, isoprene, piperylene.

B.P. 609,692. Appl. 20.3.46. Acc. 5.10.48.

Production of Polystyrene. H. M. Hutchinson and J. J. P. Staudinger. To: Distillers Co., Ltd.

B.P. 609,693. Appl. 20.3.46. Acc. 5.10.48.

Production of Plastic Compositions from Vinyl Chloride Copolymers. C. A. Brighton and J. J. P. Staudinger. To: Distillers Co., Ltd.

Improved vinyl chloride copolymer obtained by chlorination of a copolymer of vinyl chloride and a di-ester of an ethylene-alpha-beta-dicarboxylic acid.

B.P. 609,734. Appl. 5.11.45; 20.3.46; 6.8.46. Acc. 6.10.48.

Manufacture of Synthetic Resins. E. Hene.

Manufacture of synthetic resins by impregnating a porous filler with a hydrocarbon which is not polymerizable under the conditions of the process and an aqueous

solution of formaldehyde and a cyanide derivative. The mixture is kneaded or agitated and then heated to remove an excess of water.

B.P. 609,749. Appl. 15.2.46. Acc. 6.10.48.
Manufacture of Interpolymers of Polymerizable Liquid Esters with Drying Oils. D. H. Hewitt. To: Lewis Berger and Sons, Ltd.

B.P. 609,750. Appl. 15.2.46. Acc. 6.10.48.
Manufacture of Interpolymers of Styrene with Polyhydric Alcoholic Mixed Esters and of Coating Compositions obtained therefrom. L. E. Wakeford, D. H. Hewitt, and F. Armitage. To: Lewis Berger and Sons, Ltd.

B.P. 609,792. Appl. 22.3.46. Acc. 6.10.48.
Manufacture of Highly Polymeric Esters. W. K. Birtwistle.

B.P. 609,795. Appl. 22.3.46. Acc. 6.10.48.
Mouldings from Highly Polymeric Linear Esters. J. S. Byers, J. C. Swallow and J. M. Walter. To: Imperial Chemical Industries, Ltd.

Refers to the moulding of polyethylene terephthalates.

B.P. 609,796. Appl. 22.3.46. Acc. 6.10.48.
Production of Artificial Filaments. J. S. Byers and J. C. Swallow.

Refers to polyethylene terephthalate filaments.

B.P. 609,797. Appl. 22.3.46. Acc. 6.10.48.
Production of Artificial Films. J. C. Swallow and D. K. Baird. To: Imperial Chemical Industries, Ltd.

Production of polyethylene terephthalate films.

B.P. 609,798. Appl. 22.3.46. Acc. 6.10.48.
Pile Fabrics. A. H. Little. To: Imperial Chemical Industries, Ltd.

Pile fabrics made from polyethylene terephthalate filaments or fibres.

B.P. 609,825. Appl. 22.11.45. Conv. (U.S.A.) 21.8.45. Acc. 7.10.48.
Production of Styrenes and other Aromatic Compounds. To: Dominion Tar and Chemical Co.

Production of styrene by contacting 1, 1 di (m-xylyl) ethene with a zirconium silicate catalyst or 1, 1 di (p-tolyl) ethene with a titanium silicate catalyst at approximately 500 degrees C. for a contact time of less than 0.1 of a second.

B.P. 609,838. Appl. 6.3.46. Conv. (U.S.A.) 6.3.45. Acc. 7.10.48.
Manufacture of New Polymers. To: E. I. Du Pont de Nemours and Co.

A process for the manufacture of new synthetic linear polymers and inter polymers which contain masked aldehyde groups and which may or may not contain masked hydroxyl groups (copolymers of vinylacetate and acrolein acetal or methyl methacrylate and acrolein acetal).

B.P. 609,841. Appl. 14.4.46. Acc. 7.10.48.
Production of Organo-Silicon Compounds. A. E. Meadowcroft, C. Shaw and W. E. Smith.

B.P. 609,877. Appl. 22.3.46. Acc. 7.10.48.
Packing Materials. A. H. Little. To: Imperial Chemical Industries, Ltd.

Refers to the use of polyethylene terephthalate as a packing material.

B.P. 609,927. Appl. 25.3.46. Conv. (U.S.A.) 27.3.45. Acc. 8.10.48.
Production of Heat-sealable Transparent Cellulosic Sheets and Films. To: British Cellophane, Ltd.

Heat sealable transparent cellulosic sheet or film comprising a non-fibrous water sensitive cellulosic sheet or film compounded with a water soluble polyvinyl alcohol.

B.P. 609,940. Appl. 26.3.46. Acc. 8.10.48.
Copolymers of Vinyl Chloride. M. D. Cooke and J. J. P. Staudinger. To: Distillers Co., Ltd.

Refers to copolymers of vinyl chloride with di-esters of citraconic or mesaconic acid.

B.P. 609,943. Appl. 26.3.46. Acc. 8.10.48.
Dyeing of Highly Polymeric Linear Esters. A. S. Fern, D. McCreath, E. J. Vickers, T. Vickerstaff. To: Imperial Chemical Industries, Ltd.

Dyeing of polyethylene terephthalate with acetate rayon dyestuffs dissolved or disposed in aqueous media.

B.P. 609,944. Appl. 26.3.46. Acc. 8.10.48.
Printing of Fabrics. T. Vickerstaff. To: Imperial Chemical Industries, Ltd.

Printing of polyethylene terephthalate with acetate rayon dyestuffs in the presence of a swelling agent.

B.P. 609,945. Appl. 6.6.46. Acc. 8.10.48.
Dyeing of Highly Polymeric Linear Esters. T. Vickerstaff. To: Imperial Chemical Industries, Ltd.

Dyeing of polyethylene terephthalate with fur dyestuffs in the presence of a swelling agent.

B.P. 609,946. Appl. 26.3.46. Acc. 8.10.48.
Fabrics comprising Aromatic Polyesters with Patterned Effects therein. T. Vickerstaff. To: Imperial Chemical Industries, Ltd.

B.P. 609,947. Appl. 26.3.46. Acc. 8.10.48. Printing of Fabrics comprising Aromatic Polyesters. T. Vickerstaff. To: Imperial Chemical Industries, Ltd.

Printing of polyethylene terephthalate with leuco-sulphuric esters of vat dyestuffs.

B.P. 609,948. Appl. 6.6.46. Acc. 8.10.48. Dyeing of Highly Polymeric Linear Esters. A. S. Fern. To: Imperial Chemical Industries, Ltd.

Dyeing of polyethylene terephthalate with basic dyestuffs, leuco-sulphuric esters of vat dyestuffs, or by the azoic process. See also B.P. 610,020.

B.P. 610,020. Appl. 19.12.44. Acc. 11.10.48. Production of Plastic Compositions. E. S. Narracott and J. N. Haresnape. To: Anglo-Iranian Oil Co., Ltd.

Vinyl chloride polymer or co-polymer containing a filler and a plasticizer consisting of a refined or unrefined hydrocarbon extract produced by extracting the mineral oil fraction or residue with a selective solvent, one of which at least is of polar character to produce an extract consisting of hydrocarbons of molecular weight 250-750 and having initial and final boiling point within the range of 250 degrees C.-800 degrees C. Plasticizers such as T.C.P. or D.B.P. are used in addition.

B.P. 610,037. Appl. 19.12.44. Acc. 11.10.48. Production of Plastic Compositions. E. S. Narracott and J. N. Haresnape. To: Anglo-Iranian Oil Co., Ltd.

Refers to vinyl chloride polymers or co-polymers with an oil soluble lead naphthenate.

CORRECTION

B.P. 606,711 ("Plastics," January, 1949, p. 55) should read B.P. 606,701.

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Leaves from a Moulder's Notebook

This is the twenty-seventh in a series of notes by B.I.P. Development Department on the problems of the moulder and designer. Nos. 1-12 in this series are already available in booklet form and a second volume which will include this article is being prepared. Comments and enquiries are welcome. The next article in this series will be published in May.

Transfer Moulding Feeds

In No. 3 of this series, brief mention was made of the warping due to feed positioning which can occur in a moulding great in its length compared with its width or diameter; the problem is one which deserves closer examination.

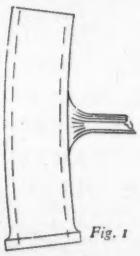

Fig. 1

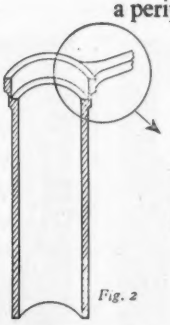

Fig. 2

Fig. 1 is typical of the result of feeding into one side of a moulding of like proportions : warping, concave to the feed, almost invariably occurs. Twins feeds, diametrically opposed, usually prevent warping.

However, experience shows that the best results are obtained if use is made of the method illustrated in Fig. 2. A ring feed operating through a peripheral gate at the top or bottom end of the moulding will seldom fail. Fig. 3 shows a cross section of such a ring feed and ring gate where it enters the moulding.

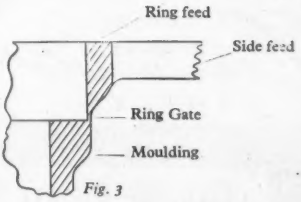

Fig. 3

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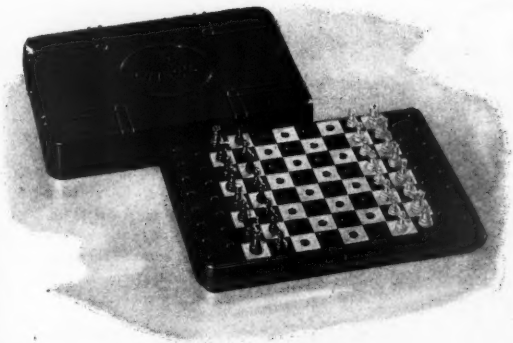

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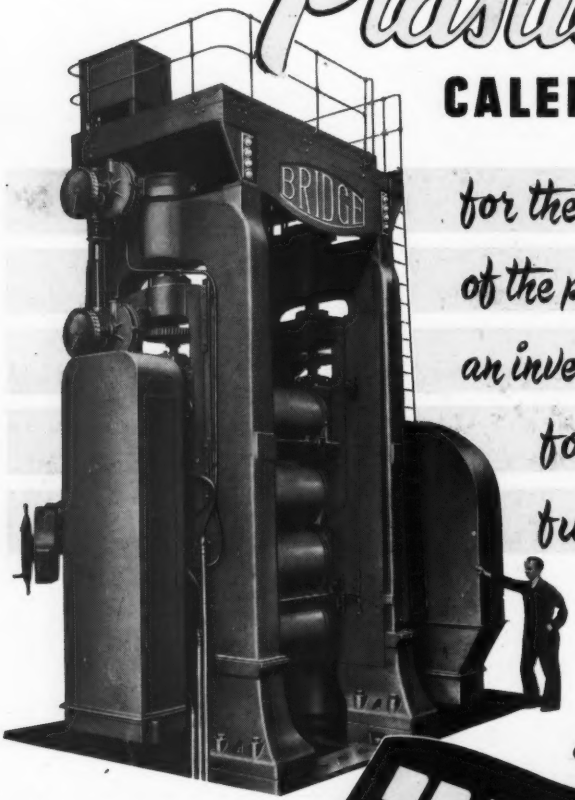

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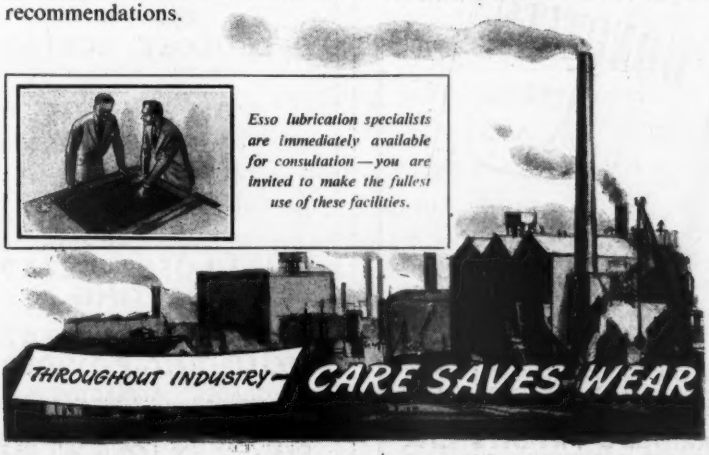
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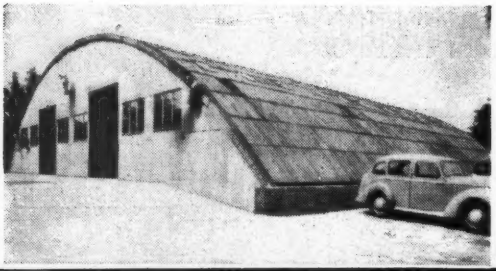

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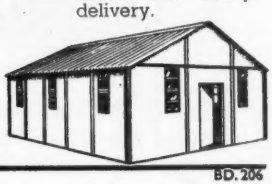

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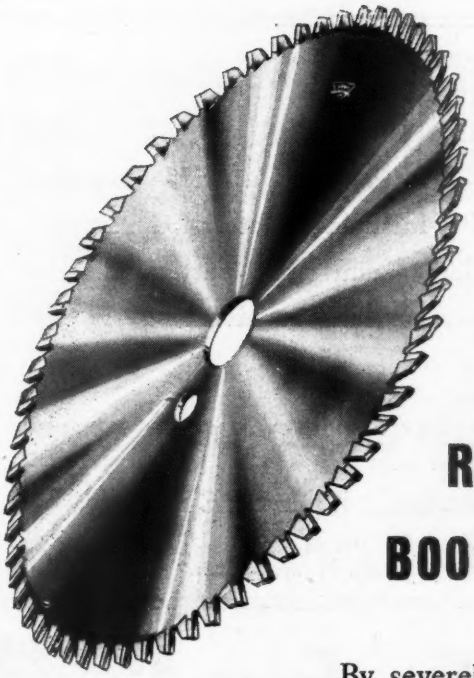

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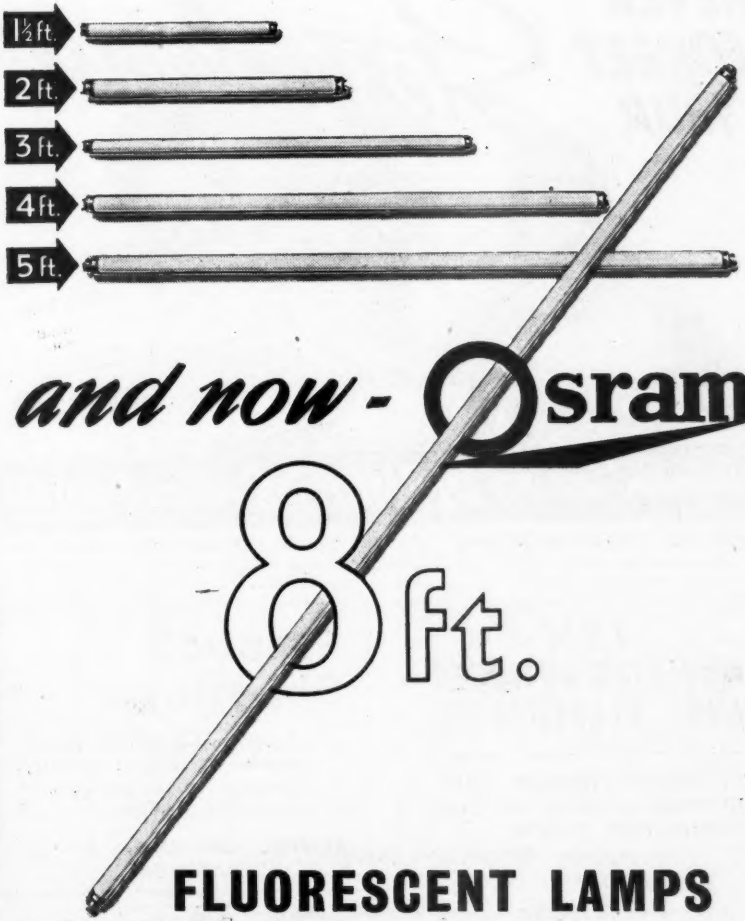

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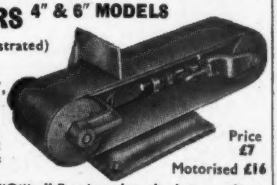

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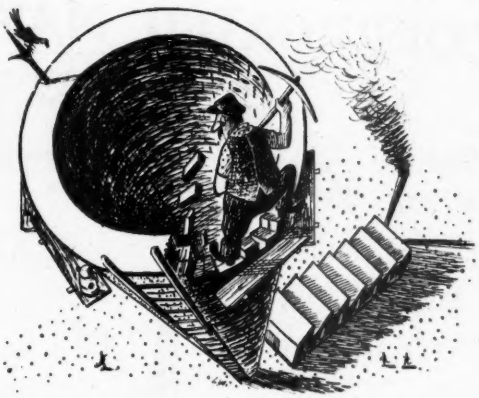

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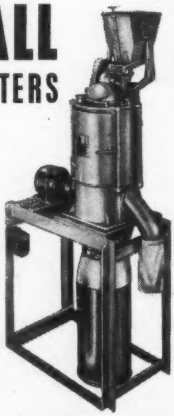

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Two die-casting machines, goose-neck type, hydraulic operation with gas-fired furnace and motorized pump, one automatic and one semi-automatic, 8 lb. capacity, by the French Oil Co., U.S.A., good condition.
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Shaw hydraulic accumulator, 120 tons cast iron weight loaded type with three throw pumps, not A.C. 415/3/50, latest design, as new.
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Plaster Casting improved by new flexible mould. Dohm, Ltd., 167 Victoria Street, S.W.1. 146-735

Two Francis Shaw Hand Injection Moulding Machines, ⅜ oz. capacity, heating cylinder 220-250 volts with rheostatic control, complete with die sets, in new condition, £130 each. Apply Tamworth Plastics, Ltd., Tamworth, Staffs. 142-37

Edgwick Type "A" Injection Moulder Maker. T. H. and J. Daniels, Ltd. Unused. Ram dia.—8 ins. Working pressure 450 lb./sq. in. Total tons 10. Max stroke 4½. Complete with two-stage air compressor, high-pressure bottles, etc., and all electrical equipment, cost £810, accept £750 for quick sale; space required. Dowty Equipment, Cheltenham. Phone, Cheltenham 53385. 142-20

Plastics. Offers invited for whole plant, fittings and stock of plastic manufacturers in Glasgow. Can be seen by arrangement with John Thorburn, Jr., and Co., 157 West George Street, Glasgow, C.2. Phone, Central 7440. 142-26

Machine tools. 1,000 ex-Government tools, etc., knock-out prices. Send for list. Firebrands, Ltd. (Dept. P.), Drub, Gomersal, Leeds. Phone, Cleckheaton 1007. 142-17

For sale, radio heater, model RH.23 Redifon, never used.
Apply: The Ray Engineering Co., Ltd., Waterdale Works, Southmead, Bristol. 142-41

Quantity of rubber or plastic spreading machines by Platt Bros. and Co., Ltd., complete with hoods and in good condition, roller width 63-in. Apply: Woodfield and Turner, Parsonage Mills, Burnley. Phone 3065. 145-822

Machinery, Tools and Plant (contd.)

Dust extractor, 6 h.p. D.C. 480-volt motor, trunking, 6 hoods, 18 bags and containers, almost new. J. Starr, 110 Mile End Road, E.1. Ste 3950. 142-x2319

Motors, five only. Newman FHAK/4 240/1/50 ¼ h.p. capacitator. Recent delivery, fair offer invited for the lot (closing down, freehold on sale). Houghtons, 324 Uxbridge Road, Shepherd's Bush. 142-x3054

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Lampshade moulds, new or second-hand, wanted. Full particulars to Box P425, care of "Plastics." 142-5

Wanted, compression-type mould for tea cups for use on 100-ton Daniels downstroke press. Give full details of design, condition and price required. Sample mouldings to be supplied if possible. Box P421, care of "Plastics." 142-1

Injection Moulding Machine, 4 oz. or 6 oz., wanted to rent. Box P4217, care of "Plastics." 142-27

Wanted, injection moulding machines, medium or large sizes. Box P4229, care of "Plastics." 142-45

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Dohm, Ltd., pulverize raw materials everywhere. 167 Victoria Street, London, S.W.1. zzz-224

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Injection moulding capacity available on 3-oz. injection moulding machine for short and long runs. Box 5327 care of "Plastics." zzz-235

P.V.C. silk screen printing. Table cloths, curtains, nursery patterns, etc. Capacity available for quantity runs. Quality work. Daily deliveries. Guaranteed adhesion and fastness of colour. Davis (Patents), Ltd., 18 Phipp Street, London, E.C.3. Bishopsgate 2939, 5091. 143-538

Repetition in Ebonite, Erinoid, etc. Capstan lathe work. Mansell, Temple Street, Rugby. 149-543

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Injection mouldings in therm-plastics. Mouldings in styrene, acrylics and acetate. Design and toolroom facilities available for mould construction. Inquiries invited. H. and E. Courtnay, Ltd., 138 Stratford Road, Birmingham, 11. 144-823

Wanted, a plastic manufacturer with assembly facilities to manufacture for local and foreign markets. All tools and equipment supplied if necessary. We want an expert and will pay top prices. Box P4226, care of "Plastics." 142-x1908

Available capacity to produce mock-up or original models, patterns, mould-patterns in plaster, modelled from designer's drawings. N. Linton Pryor, 33 Guilford Street, W.C.1. 142-x2979

"Impossible" moulding propositions invited by pioneer injection moulders with unusually qualified staff and most modern capacity up to 12 oz. Inquiries in strict confidence and without obligation. Box P4129, care of "Plastics." 142-46

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Buna-plast, a blending of synthetic rubber and P.V.C. specially processed for manufacturing leather substitute; this material is far superior to plasticized P.V.C., inquiries welcomed. Dohm, Ltd., 167 Victoria Street, London, S.W.1. zzz-230

P.V.C. calendering compound in a range of opaque colours. Dohm, Ltd., 167 Victoria Street, London, S.W.1. zzz-229

Polystyrene moulding scrap urgently required, state amount available and send small sample. Box 3185, care of "Plastics." zzz-228

Polythene moulding powder (reconstituted) in black natural and a variety of colours. Dohm, Ltd., 167 Victoria Street, London, S.W.1. zzz-226

Metal powders and oxides. Quotations and samples on application. Dohm, Ltd., 167 Victoria Street London, S.W.1. zzz-227

Ebonite and bakelite always in stock. Phone, Archway 3654. A. E. Goodeve, Ltd., 188a Seven Sisters Road, London, N.7. 151-634

2½ Tons first-quality virgin cellulose acetate moulding power, black, available. Box P427, care of "Plastics." 142-9

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Reclaimed X-ray sheet, blue tinted. Sizes 6 ins. by 4 ins., 8½ ins. by 6½ ins., 10 ins. by 8 ins., at 1s. 9d. per lb. in 1-ton lots; size 12 ins. by 10 ins., at 2s. per lb. in 1-ton lots; size 15 ins. by 12 ins., at 2s. 6d. per lb. in 1-ton lots; size 17 ins. by 14 ins., at 3s. per lb.. in 1-ton lots. Intermediate sizes also available. Delivery from stock.

Reclaimed nitrate X-ray sheet, various sizes, at 1s. 3d. per lb., in 1-ton lots; 5 tons available.

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Clear transparent acetate sheet film, 10 ins. by 6 ins., 10-tho. thick, brand-new material, 3s. 6d. per lb., in 1-ton lots.

Lloyds, 4-5 Church Street, Christchurch. Phone, Christchurch 504. zzz-241

10-15 Tons black cellulose acetate scrap available. Please state best offers. Apply, Box P4212, care of "Plastics." 142-18

Perspex sheets, flat, clear, or coloured, cut to shape, corrugated Perspex, aluminium and plastic sheeting and mouldings. Henry Moat and Son, Ltd., Atom Works, Newcastle, 1. 142-25

400 Sheets of black cellulose Acetate, 52 ins. by 24 ins. by .06 in., semi-polished both sides. Perfect condition. Best offer over 4s. 6d. per lb. Immediate delivery. Box P.P. 22277, Samson Clarks, 57-61 Mortimer Street, London, W.1. 142-30

Polystyrene (virgin). Wanted white, cream, black and light blue against cash payment. Write Box P4220, care of "Plastics." 142-34

For sale, Opal "Perspex" containers as scrap. Dimensions approximately 12 ins. by 12 ins. by 12 ins., ¼-in. thick. Large quantity; may be viewed. Liquidation stock, in new condition. Write, Box P4221, care of "Plastics." 142-36

For sale. 1 ton Beetle ("Scarab") moulding powder, in colours, green, blue, red, green mottled, blue mottled, orange mottled. Box P4223, care of "Plastics." 142-40

Virgin cellulose acetate moulding powder in transparent, translucent and opaque colours, three-flow grades, now available from stock at reasonable prices. Dohm, Ltd., 167 Victoria Street, S.W.1. zzz-249

D. H. Ridout and Son, Ltd. Reg. Office, 12 Stedman Road, Southbourne, Bournemouth. Phone, Southbourne 505.

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Offer acetate and celluloid transparent sheeting from 2s. per lb.

Bakelite laminated sheeting from 1s. 10d. per lb.

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All types of plastic tubes and rod from 4d. per ft.

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Perspex No. 6. and No. 2 quick-drying cements and polishes.

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Raw Material Available and Wanted (contd.)

Coloured "Perspex" scrap and all thermoplastic scraps collected from your works at the best terms. Michael S. Stevens, Ormond Road, Richmond, Surrey. Phone 0211. 142-44

Wanted, thermoplastic moulding powders and moulding scraps, all kinds. Offers and samples to Alfa Plastics, Ltd., 20-21 St. Dunstan's Hill, E.C.3. 142-47

Scrap. Why not let a well-established firm quote you for cellulose acetate, polystyrene and other thermoplastic off-cuts and scrap? Having best use for these materials, highest prices can be paid. Quotations on receipt of representative samples to M. H. Grist (Plastics), Ltd., 82-84 Brighton Road, Surbiton, Surrey. Phone, Elmbridge 4214. 142-43

TRANSPARENT ACETATE.

60 Thou. 500 lb. each Green, Blue and Smoke, perfect as delivered by British Celanese.

Also

40 Thou. 1 ton Clear, 4s. per lb.

Large stocks of Acetate in clear and colours, 3 Thou.-40 Thou.

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Always large stocks of
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rods, tubes and sheets,
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sheets up to 1-in. thick.
CELLULOSE ACETATE.
S. Rosenfeld,
93 Aldersgate Street, E.C.1.
Phone, Monarch 4686. 146-594

Perspex off-cuts (large) required, cleared and coloured. Please write Occupational Therapy Supplies, Marion Parade, Tooting, S.W.17. 142-579

Required urgently, polystyrene powder, virgin or regrounded, preferably pastel colours; good price paid. Reply Box P4116, care of "Plastics." 142-728

"Perspex" offcuts. Required, large or small quantities. Please write, J. E. Hoare (O.T.S.), Ltd., 134-144 High Street, S.W.17. 144-732

Wanted, "Perspex" offcuts, coloured and clear, suitable for handicraft work. Please send samples, price, to Arts and Crafts (Doncaster), Ltd., West Laith Gate, Doncaster. 142-734

J. H. Berry (Plastics).
Recognized stockholders of "Perspex" acrylic sheet. Large and varied stocks in clear and coloured always on hand.
Catalin in a variety of sections.
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Special offer. Plastic thonging, 3 mm. by 1 mm., 50s. per 1,000 yds. "Tenaplas" plastic wire, covering tube ⅛ in. by .5 in., ivory, 40s. 1,000 ft. 2 mm. by .5 in. in a variety of colours, 27s. 100 ft.
Plastic-covered twin-core electric cable, 23/36 by .65. 8s. per 100 ft.
Linen bases "Tufnol" and "Bakelite" sheets, ¼ in. and 5/32 in.
J. H. Berry (Plastics), Annesley Woodhouse, Notts. zzz-246

Accurate powders for ceramic, alloy, plastic, paint, etc., industries. Dohm, Ltd., Pulverisers, 167 Victoria Street, London, S.W.1. zzz-248

Black cellulose aceto-butyrate for disposal. Sample on request; 3s. per lb. delivered. Box P422, care of "Plastics." 142-2

Perspex offcuts required (large), coloured and clear. Details to Handicraft Supplies, 26 Chapel Street, London, N.W.1. 142-6

SITUATIONS VACANT

None of the vacancies in these columns relates to a man between the ages of 18 and 50 inclusive, or a woman between the ages of 18 and 40, inclusive, unless he or she is excepted from the provisions of the Control of Engagement Order, 1947, or the vacancy is for employment excepted from the provisions of that Order.

Working foreman, plastic moulding (compression), required by small firm in Essex. Shift work entailed. Permanent and well-paid position for the right type of man. Send fullest details and wages required to Box P419, care of "Plastics." 143-05

Situations Vacant (contd.)

Monsanto Chemicals, Ltd., require a plastics technologist, with good qualifications and experience, for technical service and development work in their new research laboratories at Ruabon. This post presents excellent possibilities for advancement; commencing salary up to £850. Apply in writing, with full particulars to the Chief Personnel Officer, Monsanto Chemicals, Ltd., 8 Waterloo Place, London, S.W.1. 142-11

Plastic sheeting salesman required for the sale of finest quality material to makers-up, handbag and travel goods manufacturers. Box P429, care of "Plastics." 142-13

Technical representative wanted by well-known company for the introduction of materials for moulding powders. B.Sc. or other qualifications an advantage. Box P4210, care of "Plastics." 142-14

Draughtsman (senior), jig and tool, for interesting post with electrical and mechanical engineers, S.W. London area. Must have served recognized apprenticeship and be conversant with press tools, plastic moulds, hydraulics and general tooling. Higher National education essential, some electrical knowledge preferred. Salary up to £450 per annum according to age and experience. Write full particulars to Box P4211, care of "Plastics." 142-15

Rubber technologist or chemist (qualified) is required for research laboratory in West London area. Candidates should have experience in industry and will be required to work on rubber and plastics problems. Applications, giving details and qualifications, experience, age and salary required to be made to Staff Officer, British Insulated Callender's Cables, Ltd., Bical House, 21 Bloomsbury Street, London, W.C.1. 142-21

Established firm of plastic moulders require representatives, preference given to applicants with connections and knowledge of the trade, salary generous in accordance with ability, permanent position. Box P423, care of "Plastics." 143-820

A Vacancy exists for works' chemist to take charge of technical works control in modern factory of leading manufacturers, S.E. London. Applicants should possess sound knowledge of the chemistry of nitro cellulose and P.V.C. and should also be familiar with colouring pigments. Experience of cloth spreading an advantage. This is a 'permanent and progressive position with excellent opportunities. Salary in accordance with qualifications and experience. Box P4224, care of "Plastics." 142-x2159

Working Factory Manager required, fully experienced in plastic extrusion and insulated wire manufacture, for South Wales. Write full details of experience, age and salary required. Box P4227, care of "Plastics." 142-x2535

Rubber Chemist. Junior chemist, with University Degree or equivalent qualification, required for research work on high polymer dispersions. Minimum salary £360, plus cost of living bonus. Apply, Technical Director, B.B. Chemical Co., Ltd., Ulverscroft Road, Leicester. 142-31

Representatives wanted in all areas by reputable firm of plastic raw material manufacturers. Representatives already calling on plastic moulders, wishing to carry additional lines will be considered. Full details, Box P4214, care of "Plastics." 142-22

Practical physical chemist required by P.V.C. leathercloth manufacturing company in the London area. B.Sc. in Chemistry and at least five years practical experience of P.V.C. essential. Age not more than 35. Must be capable of organizing and supervising research and laboratories testing. Commencing salary £600-£800 per annum. The position offers unusual scope to an individual combining technical and organizing abilities. Please write, giving full details of experience and capabilities, which will be treated in full confidence. Box P4215, care of "Plastics." 142-23

Sales representative required by expanding leathercloth manufacturing company for the London area. Salary £750-£1,000 per annum. Age 25-40. Own car. The position offers considerable scope to the right individual, who should have knowledge of leathercloth and P.V.C., experience of the handbag and furniture trades and good working knowledge and experience of sales organization and salesmanship. Must be capable of becoming a sales manager. Please write, giving full details of experience and capabilities, which will be treated in full confidence. Box P4216, care of "Plastics." 142-24

Male assistant to manager of manufacturers' office for Manchester and district. Fancy metal goods and plastic trade, wholesale only. Duties in office and some travelling. Reply, giving age and particulars of previous experience. Box P4218, care of "Plastics." 142-28

Situations Vacant (contd.)

Representative required by important manufacturer to call on fancy goods and hardware trade, etc., wholesale and department stores. London area. Connection and highest qualifications necessary. State age and experience. Box P4219, care of "Plastics." 142-29

Latex Chemist. Industrial chemist, aged about 25 years, with University Degree or equivalent qualification, required for research laboratory. Experience of aqueous dispersions of rubber and synthetic rubber-like polymers would be an advantage. Minimum salary £450, plus cost of living bonus. Apply, Technical Director, B.B. Chemical Co., Ltd., Ulverscroft Road, Leicester. 142-32

The General Electric Co., Ltd., has a vacancy for a plastics sales engineer at their head office in London. Applicants should be under 30 years of age and should have had works experience in the plastics industry. Previous sales experience is not essential, but would be an advantage. Salary would be according to age and qualifications. Apply, Staff Manager, G.E.C. Magnet House, Kingsway, W.C.2. 142-35

Chemist for research on synthetic resins required by well-known manufacturers near London. Experience in physical and organic chemistry desirable, but newly qualified candidates of good degree considered. Ph.D. standard preferred. Permanent and progressive position with good salary. Apply, giving full particulars of age, education, experience and salary, required in strictest confidence, Box P4222, care of "Plastics." 142-38

Technologist. Chemist for technical service work required for senior position in rubber adhesives development Department, aged about 30, with good personality and presence and possessing University Degree, or equivalent qualification. Practical experience in rubber technology and related fields of work is essential, whilst some engineering knowledge would be an advantage. The position entails laboratory and extra-mural experimental work, necessitating a certain amount of travelling and offering good prospects to a practical man with administrative potentialities. Salary according to age and qualifications. Apply, Technical Director, B.B. Chemical Co., Ltd., Ulverscroft Road, Leicester. 142-33

Physicist required to take charge of Physical Testing Laboratories, concerned with the evaluation and testing of plastics and rubber-like polymers. Sound knowledge of electrical, physical and dynamic test methods essential. Applicant must possess good organizational abilities and be capable of arranging and supervising the routine work of a team of young assistants and developing new methods of testing.
Applicants, who should be between 25 and 35 years of age, and possess a 1st or 2nd Class Honours B.Sc. Degree, should apply, in the first instance, to the Controller of Research and Development, The Distillers Co., Ltd., 21 St. James's Square, London, S.W.1. 142-130

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Vacancies exist in the Distillers Co., Ltd., Research Organization for two organic chemists for development work on plastics manufacture. Applicants should be under 26 years of age and possess a B.Sc. Degree, or equivalent, in Chemistry. Commencing salary will depend upon age, qualifications and experience.
Applications should be submitted in the first instance to the Controller of Research and Development, The Distillers Co., Ltd., 21 St. James's Square, London, S.W.1. 142-731

SITUATIONS WANTED

Organic chemist, Indian, who is completing his post-graduate work at a British University in April this year, desires to represent, on his return to India, a firm of plastics manufacturers. Apply Box P4213, care of "Plastics." 142-19

Situations Wanted (contd.)

Production Manager or Assistant to Works Manager, 20 years' experience of industry, compression and inspection, sound knowledge works administration; also executive experience, good disciplinarian, seeks change. South of England or abroad. Age 39 years. Box P428, care of "Plastics." 142-12

Plastics engineer, 20 years with laminated material manufacturers, includes experience in technical sales, development work and engineering department. Seeks position of responsibility where application of laminated materials to industrial problems is of value. Box P4228, care of "Plastics." 143-x3053

Plastics (S and F) mould design executive, 28, res. Birmingham, seeks prog. technical appt. Wou'd represent. Replies answered. Box P4225, care of "Plastics." 142-x2232

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Factory time recorders. Service rental. Phone, Hop 2239. Time Recorder Supply and Maintenance Co., 157-159 Borough High Street, S.E.1. 149-544

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English town crests. Ideal for Perspex, etc. Will double your sales; 6s. per dozen. J. E. Hoare (O.T.S.), Ltd., Dept. P1, Marion Parade, High Street, S.W.17. 144-733

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Plastic textile bobbins. Will plastic moulding firms interested in possibilities plastic-bobbins, contact advertiser, 40 years' experience practical, administrative and sales. Extensive connections wood-bobbins for wool textile industry. View buying or selling agencies. All essential detail relative to bobbins in conjunction your technical staff, on interview arranged your works. Write Box P424, care of "Plastics." 147-4

Screwcap containers, 1 in. diameter, plain parallel inside walls, wanted, 5-10 gross only. G. Nissel and Co., Ltd., Siddons Lane, Baker Street, N.W.1. 142-39

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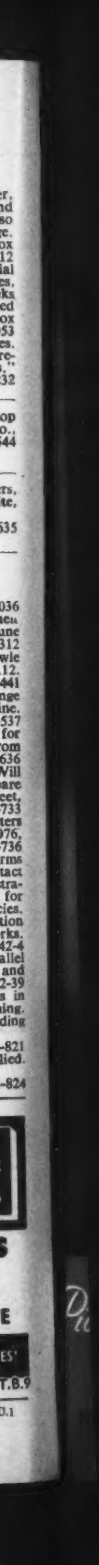

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MARCH, 1949. Vol. XIII. No. 142 **Plastics** TWO SHILLINGS

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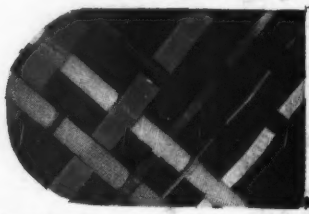

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